

Set	Items	Description
S1	1769717	S OSTE? OR OSSO? OR OSTO? OR OSSE? OR ENDOSTE? OR PERIOSTE?
S2	3993461	S BONE? ? OR ORTHOPED? OR ORTHOPAED? OR OSSEOUS? OR SKELET?
S3	369449	S OSTEAL OR OSTEOID OR OSSEO? OR OSTEOL? OR PERIOSTE??? OR OSSIF? OR FEMUR?
S4	556270	S TIBIA? OR MUSCULOSKELET? OR HUMER? OR FIBULA?
S5	4035079	S PLATE? OR LAMINA? OR STRATA? OR STRATUM? OR PLANK? OR FACEPLAT? OR PANE? OR LAMELLA?
S6	385724	S BASEPLATE? OR FLAT?()PIECE? OR BRACE? OR METALPLATE? OR BRACKET? OR METAL?(2N)SHEET?
S7	238069	S S1:S4 AND S5:S6
S8	24120	S SUBCUTAN? OR SUB()CUTAN? OR IMPLANT? OR INVASIV? OR ENDOPROSTH? OR ENDO()PROSTHE?
S9	457	S (UNDER? OR BENEATH OR SUB OR INSIDE? OR WITHIN OR INTERIOR? OR INTERNAL? OR BELOW?) (3N) (SKIN? OR DERM? OR EPIDERM? OR CUTAN? OR TRANSDERM? OR TOPICAL?)
<del>S10</del>	22054	<del>S</del> ROTAT? OR ORIENT? OR ADJUST? OR PIVOT? OR ANGLE? OR ANGULAR? OR MANIPULAT?
S11	37942	S MOVEMENT? OR MOTION? OR PITCH? OR SLUE? OR SKEW? OR SWIVEL? OR CIRCUMVOLV?
S12	23	S (TURN? OR SWING?)()AROUND? OR CIRCUMROTAT?
S13	32845	S JOINT? OR HINGE? OR HINGING? OR AXIS? OR AXLE? OR ARTICULAT? OR OSCILLAT?
S14	36760	S PIVOT? OR JOINT? OR HINGE? OR HINGING? OR ROTAT? OR AXIS? OR AXLE? OR ARTICULAT? OR OSCILLAT?
S15	899	S SWING? OR SWIVEL? OR SLUE? OR CAM OR CAMS OR CAMMED OR CAMPING OR <del>FULCRUM</del> ?CAM OR CAMS OR CAMMED OR CAMPING OR FULCRUM?
S16	630	S LANDMARK? OR REFERENCE()MARK? ? OR PREDEFIN?(2N) (MARK? ? OR MARKING? OR MARKER?) OR INDICIA?
S17	1257	S GAUGE? OR (GEOMETRIC? OR MEASUR?) (2N) (INSTRUMENT? OR TOOL? ? OR DEVICE? OR APPARATUS? OR IMPLEMENT? OR APPLIANC? OR HANDTOOL?)
S18	1162	S DIAGRAM? OR BLUEPRINT? OR YARDSTICK? OR STENCIL? OR TEMPLAT? OR BENCHMARK?
S19	81	S GRADATION? OR GRADUAT?()SCALE? OR UNIFORM? (2N) MEASUR?
S20	3	S AU=(HUEBNER R? OR HUEBNER, R?)
S21	0	S HUEBNER (2N) RAND???
S22	12521	S S7 AND S1:S4 (7N) S5:S6 AND S8:S9
S23	192	S S22 AND S16:S19
S24	4525	S S22 AND S10:S15
S25	101	S S23 AND S24
S26	12521	S S22:S24
S27	12	S S26 AND S1:S4 (5N) S5:S6 AND S5:S6 (5N) S10:S15 AND S16:S19 (10N) S10:S15
S28	96	S S7 AND S1:S4 (5N) S5:S6 AND S5:S6 (50N) S10:S15 AND S16:S19 (5N) (S10:S15 OR S5:S6)
S29	169	S S25 OR S27:S28
S30	107	S S29 AND PY=1970:2003
S31	107	S S29 NOT PY=2004:2007
S32	107	S S30:S31
S33	66	RD (unique items)
; show files		

[File 2] INSPEC 1898-2007/Feb W4

(c) 2007 Institution of Electrical Engineers. All rights reserved.

[File 5] Biosis Previews(R) 1926-2007/Mar W1

(c) 2007 The Thomson Corporation. All rights reserved.

\*File 5: BIOSIS has been enhanced with archival data. Please see HELP NEWS 5 for information.

[File 6] NTIS 1964-2007/Mar W1

(c) 2007 NTIS, Intl Cpyrgh All Rights Res. All rights reserved.

[File 8] **Ei Compendex(R)** 1884-2007/Feb W4  
(c) 2007 Elsevier Eng. Info. Inc. All rights reserved.

[File 23] **CSA Technology Research Database** 1963-2007/Feb  
(c) 2007 CSA. All rights reserved.

[File 25] **Weldasearch** 1966-2007/Jan  
(c) 2007 TWI Ltd. All rights reserved.

[File 34] **SciSearch(R) Cited Ref Sci** 1990-2007/Feb W4  
(c) 2007 The Thomson Corp. All rights reserved.

[File 35] **Dissertation Abs Online** 1861-2007/Feb  
(c) 2007 ProQuest Info&Learning. All rights reserved.

[File 36] **MetalBase** 1965-20070305  
(c) 2007 The Thomson Corporation. All rights reserved.

[File 45] **EMCare** 2007/Feb W4  
(c) 2007 Elsevier B.V. All rights reserved.

[File 63] **Transport Res(TRIS)** 1970-2007/Feb  
(c) fmt only 2007 Dialog. All rights reserved.

[File 65] **Inside Conferences** 1993-2007/Mar 07  
(c) 2007 BLDSC all rts. reserv. All rights reserved.

[File 73] **EMBASE** 1974-2007/Mar 07  
(c) 2007 Elsevier B.V. All rights reserved.

[File 94] **JICST-EPlus** 1985-2007/Mar W2  
(c) 2007 Japan Science and Tech Corp(JST). All rights reserved.

*\*File 94: UD200609W2 is the last update for 2006. UD200701W1 is the first update for 2007. The file is complete and up to date.*

[File 95] **TEME-Technology & Management** 1989-2007/Mar W1  
(c) 2007 FIZ TECHNIK. All rights reserved.

[File 99] **Wilson Appl. Sci & Tech Abs** 1983-2007/Feb  
(c) 2007 The HW Wilson Co. All rights reserved.

[File 144] **Pascal** 1973-2007/Feb W4  
(c) 2007 INIST/CNRS. All rights reserved.

[File 155] **MEDLINE(R)** 1950-2007/Mar 02  
(c) format only 2007 Dialog. All rights reserved.

[File 431] **MediConf: Medical Con. & Events** 1998-2004/Oct B2  
(c) 2004 Dr. R. Steck. All rights reserved.

*\*File 431: The file no longer updates.*

[File 434] **SciSearch(R) Cited Ref Sci** 1974-1989/Dec  
(c) 2006 The Thomson Corp. All rights reserved.

[File 583] **Gale Group Globalbase(TM)** 1986-2002/Dec 13  
(c) 2002 The Gale Group. All rights reserved.  
*\*File 583: This file is no longer updating as of 12-13-2002.*

Set	Items	Description
S1	38569	S OSTE? OR OSSO? OR OSTO? OR OSSE? OR ENDOSTE? OR PERIOSTE?
S2	117990	S BONE? ? OR ORTHOPED? OR ORTHOPAED? OR OSSEOUS? OR SKELET?
S3	9018	S OSTEAL OR OSTEOID OR OSSEO? OR OSTEOL? OR PERIOSTE??? OR OSSIF? OR FEMUR?
S4	6232	S TIBIA? OR MUSCULOSKELET? OR HUMER? OR FIBULA?
S5	3140779	S PLATE? OR LAMINA? OR STRATA? OR STRATUM? OR PLANK? OR FACEPLAT? OR PANE? OR LAMELLA?
S6	343245	S BASEPLATE? OR FLAT?()PIECE? OR BRACE? OR METALPLATE? OR BRACKET? OR METAL?(2N) SHEET?
S7	24413	S S1:S4 AND S5:S6
S8	1464	S SUBCUTAN? OR SUB()CUTAN?
S9	103	S (UNDER? OR BENEATH OR SUB OR INSIDE? OR WITHIN OR INTERIOR? OR INTERNAL? OR BELOW?) (3N) (SKIN? OR DERM? OR EPIDERM? OR CUTAN? OR TRANSDERM? OR TOPICAL?)
S10	6937	S ROTAT? OR ORIENT? OR ADJUST? OR PIVOT? OR ANGLE? OR ANGULAR? OR MANIPULAT?
S11	2512	S MOVEMENT? OR MOTION? OR PITCH? OR SLUE? OR SKEW? OR SWIVEL? OR CIRCUMVOLV?
S12	21	S (TURN? OR SWING?) ()AROUND? OR CIRCUMROTAT?
S13	6087	S JOINT? OR HINGE? OR HINGING? OR AXIS? OR AXLE? OR ARTICULAT? OR OSCILLAT?
S14	7437	S PIVOT? OR JOINT? OR HINGE? OR HINGING? OR ROTAT? OR AXIS? OR AXLE? OR ARTICULAT? OR OSCILLAT?
S15	515	S SWING? OR SWIVEL? OR SLUE? OR CAM OR CAMS OR CAMMED OR CAMPING OR FULCRUM?CAM OR CAMS OR CAMMED OR CAMPING OR FULCRUM?
S16	16	S LANDMARK? OR REFERENCE()MARK? ? OR PREDEFIN?(2N) (MARK? ? OR MARKING? OR MARKER?)
S17	314	S GAUGE? OR (GEOMETRIC? OR MEASUR?) (2N) (INSTRUMENT? OR TOOL? ? OR DEVICE? OR APPARATUS? OR IMPLEMENT? OR APPLIANC? OR HANDTOOL?)
S18	527	S DIAGRAM? OR BLUEPRINT? OR YARDSTICK? OR STENCIL? OR TEMPLAT? OR BENCHMARK?
S19	24	S GRADATION? OR GRADUAT?()SCALE? OR UNIFORM? (2N) MEASUR?
S20	13	S AU=(HUEBNER R? OR HUEBNER, R?)
S21	0	S HUEBNER(2N) RAND???
S22	8245	S IC=(A61B? OR A61F?)
S23	0	S MC=(P31? OR P32?)
S24	8916	S S7 AND S1:S4(10N)S5:S6
S25	4619	S S24 AND S22:S23
S26	8916	S S24:S25
S27	178	S S26 AND S10:S15 AND S16:S19
S28	2	S S27 AND S8:S9
S29	175	S S27 NOT (S28 OR S20)
S30	101	S S29 AND (S10:S15 OR S16:S19) (10N)S5:S6
S31	141	S 29 AND S1:S4(10N) (S10:S15 OR S16:S19)
S32	240	S S30:S31
S33	125	S S29 AND S1:S4(10N) (S10:S15 OR S16:S19)
S34	144	S S30 OR S33
S35	76	S S34 AND AC=US/PR
S36	62	S S35 AND AY=(1970:2003)/PR
S37	55	S S35 NOT AY=(2004:2007)/PR
S38	68	S S34 NOT S35
S39	55	S S38 AND AY=1970:2003
S40	55	S S38 NOT AY=2004:2007
S41	123	S S36:S37 OR S39:S40
S42	123	IDPAT (sorted in duplicate/non-duplicate order)
S43	121	IDPAT (primary/non-duplicate records only)

; show files

[File 347] JAPIO Dec 1976-2006/Nov(Updated 070228)

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[File 350] **Derwent WPIX 1963-2006/UD=200715**

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*\*File 350: DWPI has been enhanced to extend content and functionality of the database. For more info, visit <http://www.dialog.com/dwpi/>.*

20/7/1 (Item 1 from file: 350) [Links](#)

Derwent WPIX

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0015363025 *Drawing available*

WPI Acc no: 2005-713293/200573

XRPX Acc No: N2005-585877

**Fixing device for treating fractured or cut humerus bone has plate member coupled to bone plate to extend partially around bone from bone plate to position adjacent surface region on bone which is oblique or perpendicular to footprint**

Patent Assignee: HUEBNER R J (HUEB-I); TARCAU B (TARC-I)

Inventor: HUEBNER R J; TARCAU B

Patent Family ( 1 patents, 1 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20050240187	A1	20051027	US 2004564853	P	20040422	200573	B
			US 2005112858	A	20050422		

Priority Applications (no., kind, date): US 2004564853 P 20040422; US 2005112858 A 20050422

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes
US 20050240187	A1	EN	13	8	Related to Provisional US 2004564853

#### Alerting Abstract US A1

NOVELTY - A plate member (22) is coupled to a bone plate (20) to extend partially around a bone (12) from the bone plate to a position adjacent a surface region on the bone which is oblique or perpendicular to a footprint on the bone plate. The bone plate is fitted into the bone to longitudinally extend the bone plate along the bone.

USE - For treating fractured or cut humerus bone.

ADVANTAGE - Retains ability of bone to support, store minerals and form blood cells. Reduces pain and deformation of bone. Ensures prompt and proper repair of damaged bone.

DESCRIPTION OF DRAWINGS - The figure shows the lateral view of a bone fixing system.

10 Bone fixing system

12 Bone

14 Fixing device

20 Bone plate

22 Plate member

20/7/2 (Item 2 from file: 350) [Links](#)

Derwent WPIX

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0015339553 *Drawing available*

WPI Acc no: 2005-689810/200571

XRPX Acc No: N2005-566269

**Application method for directing fastener to bone plate, involves placing fastener with thread along guide path opposite direction so that fastener approaches bone plate from bone and couples to bone plate**

Patent Assignee: ACUMED LLC (ACUM-N); HUEBNER R J (HUEB-I)

Inventor: HUEBNER R J

Patent Family ( 2 patents, 108 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20050234472	A1	20051020	US 2004563860	P	20040419	200571	B
			US 2005109984	A	20050419		
WO 2005102193	A2	20051103	WO 2005US13318	A	20050419	200572	E

Priority Applications (no., kind, date): US 2004563860 P 20040419; US 2005109984 A 20050419

Patent Details

Patent Number	Kind	Lang	Pgs	Draw	Filing Notes	
US 20050234472	A1	EN	15	14	Related to Provisional	US 2004563860
WO 2005102193	A2	EN				
National Designated States,Original	AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KM KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SM SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW					
Regional Designated States,Original	AT BE BG BW CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IS IT KE LS LT LU MC MW MZ NA NL OA PL PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW					

20/7/3 (Item 3 from file: 350) [Links](#)

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0015339549 *Drawing available*

WPI Acc no: 2005-689806/200571

XRPX Acc No: N2005-566265

**Stabilization system for bone, has auxiliary plate, mounted on bone plate, that extends proximally to aperture and distally to footprint to stabilize distal fragment of radius bone**

Patent Assignee: HUEBNER R J (HUEB-I)

Inventor: HUEBNER R J

Patent Family ( 1 patents, 1 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20050234458	A1	20051020	US 2004563767	P	20040419	200571	B
			US 2005109985	A	20050419		

Priority Applications (no., kind, date): US 2004563767 P 20040419; US 2005109985 A 20050419

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20050234458	A1	EN	13	11	Related to Provisional	US 2004563767

#### Alerting Abstract US A1

NOVELTY - A bone plate (40) has multiple openings (46) that receive multiple fasteners for securing to a radius bone (22). An auxiliary plate, mounted on the bone plate, extends proximally to the aperture and distally to a footprint to stabilize the distal fragment of the radius bone.

USE - For stabilizing bone.

ADVANTAGE - Reduces pain and disfigurement of bones. Prevents loss of bone functions.

DESCRIPTION OF DRAWINGS - The figure shows the top view of the stabilization system.

22 Radius bone

24,28 Bone fracture

40 Bone plate

46 Openings

20/7/4 (Item 4 from file: 350) [Links](#)

Derwent WPIX

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0014947547 *Drawing available*

WPI Acc no: 2005-295310/200530

Related WPI Acc No: 2004-399752; 2004-399753; 2004-399754; 2004-399755; 2004-399761

XRPX Acc No: N2005-242522

**Bone plate for fixation of distal radius fractures, has locking aperture for receiving fastener that locks to proximal portion such that fastener extends at angular offset from orthogonal to proximal portion**

Patent Assignee: HUEBNER R J (HUEB-I)

Inventor: HUEBNER R J

Patent Family ( 1 patents, 1 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20050085818	A1	20050421	US 2003512111	P	20031017	200530	B
			US 2004968850	A	20041018		

Priority Applications (no., kind, date): US 2003512111 P 20031017; US 2004968850 A 20041018

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20050085818	A1	EN	15	14	Related to Provisional	US 2003512111

#### Alerting Abstract US A1

NOVELTY - The bone plate (80) has a plate member having a proximal portion (84) and a distal portion (86) having multiple apertures (94). The proximal portion has a locking aperture (96) for receiving a fastener that locks to proximal portion such that fastener extends at an angular offset from orthogonal to proximal portion.

DESCRIPTION - The proximal and distal portions are secured to the distal surface region of a radius bone adjacent the opposing sides of a fracture in radius bone using fasteners received in apertures. An INDEPENDENT CLAIM is also included for a method of fixing distal radius fractures.

USE - For fixation of distal radius fractures.

ADVANTAGE - Ensures that skeleton retains its ability to perform functions e.g. support, movement, protection, storage of minerals, and formation of blood cells. Effectively fastens plate to pieces of bone opposite sides of fracture using fasteners e.g. screws and/or wires, so that bone pieces are fixed in position.

DESCRIPTION OF DRAWINGS - The figure shows the lateral view of a system for fixation of fractured distal radius bone using a bone plate and bone screws.

80 Bone plate

84 Proximal portion

86 Distal portion

94 Apertures

96 Locking aperture

20/7/5 (Item 5 from file: 350) [Links](#)

Derwent WPIX

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0014214019 *Drawing available*

WPI Acc no: 2004-399761/200437

Related WPI Acc No: 2004-399752; 2004-399753; 2004-399754; 2004-399755; 2005-295310

XRPX Acc No: N2004-318695

**Guide device of hole forming tool and fastener, for bone repair devices, has guide portion configured to guide at least one hole forming tool and fastener into bone and to predetermined position in bone repair device e.g. bone plate**

Patent Assignee: HORST S P (HORS-I); HUEBNER R J (HUEB-I); ACUMED LLC (ACUM-N)

Inventor: HORST S P; HUEBNER R J

Patent Family ( 2 patents, 1 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040102788	A1	20040527	US 2002427910	P	20021119	200437	B
			US 2003512322	P	20031017		
			US 2003717401	A	20031119		
US 7153309	B2	20061226	US 2003717401	A	20031119	200702	E

Priority Applications (no., kind, date): US 2002427910 P 20021119; US 2003512322 P 20031017; US 2003717401 A 20031119

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
					Related to Provisional	US 2002427910
US 20040102788	A1	EN	13	8	Related to Provisional	US 2002427910
					Related to Provisional	US 2003512322

#### Alerting Abstract US A1

NOVELTY - A guide portion (76) is configured to guide at least one hole forming tool and a fastener into the bone and to a predetermined position in a bone repair device e.g. bone plate (52).

DESCRIPTION - DEPENDENT CLAIMS are also included for the following:

- A. Method of bone repair; and
- B. System for repairing a bone.

USE - For bone repair devices used for elderly patients.

ADVANTAGE - Can reduce or fix radial bone fractures of the elderly.

DESCRIPTION OF DRAWINGS - The figure is an end view of a guide system.

52 Bone plate

54 Guide device

60 Guide element

76 Guide portion

20/7/6 (Item 6 from file: 350) [Links](#)

Derwent WPIX

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0014214013 *Drawing available*

WPI Acc no: 2004-399755/200437

Related WPI Acc No: 2004-399752; 2004-399753; 2004-399754; 2004-399761; 2005-295310

XRPX Acc No: N2004-318689

**Bone plate for providing support, movement, protection to bone, has joint which is adjusted by pivotal movement of plate element when in pivotable configuration, and is fixed at angular disposition when in fixed configuration**

Patent Assignee: ACUMED LLC (ACUM-N); HORST S P (HORS-I); HUEBNER R J (HUEB-I)

Inventor: HORST S P; HUEBNER R J

Patent Family ( 7 patents, 106 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040102778	A1	20040527	US 2002427908	P	20021119	200437	B
			US 2002427910	P	20021119		
			US 2003512111	P	20031017		
			US 2003512136	P	20031017		
			US 2003512322	P	20031017		
			US 2003512323	P	20031017		
			US 2003716719	A	20031119		
WO 2004045389	A2	20040603	WO 2003US37231	A	20031119	200437	E
AU 2003295749	A1	20040615	AU 2003295749	A	20031119	200470	E
EP 1567071	A2	20050831	EP 2003786953	A	20031119	200561	E
			WO 2003US37231	A	20031119		
GB 2412590	A	20051005	WO 2003US37231	A	20031119	200565	E
			GB 200512488	A	20050620		
JP 2006506197	W	20060223	WO 2003US37231	A	20031119	200619	E
			JP 2004554004	A	20031119		
US 7090676	B2	20060815	US 2003716719	A	20031119	200654	E

Priority Applications (no., kind, date): US 2003512323 P 20031017; US 2003512322 P 20031017; US 2003512136 P 20031017; US 2003512111 P 20031017; US 2002427910 P 20021119; US 2002427908 P 20021119; US 2003716719 A 20031119

Patent Details

20/7/7 (Item 7 from file: 350) [Links](#)

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0014214012 *Drawing available*

WPI Acc no: 2004-399754/200437

Related WPI Acc No: 2004-399752; 2004-399753; 2004-399755; 2004-399761; 2005-295310

XRPX Acc No: N2004-318688

**Bone fixing method used in bone fracture repair surgery involves deforming bone plate after securing anchor portions of bone plate to different portions of bone fracture**

Patent Assignee: HUEBNER R J (HUEB-I)

Inventor: HUEBNER R J

Patent Family ( 1 patents, 1 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040102777	A1	20040527	US 2002427908	P	20021119	200437	B
			US 2003512136	P	20031017		
			US 2003717402	A	20031119		

Priority Applications (no., kind, date): US 2003512136 P 20031017; US 2002427908 P 20021119; US 2003717402 A 20031119

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20040102777	A1	EN	14	13	Related to Provisional	US 2002427908
					Related to Provisional	US 2003512136

#### Alerting Abstract US A1

NOVELTY - The method involves deforming a bone plate (24) after securing anchor portions (26,28) of the bone plate to different portions (30,32) of a bone fracture (20).

DESCRIPTION - DEPENDENT CLAIMS are also included for the following:

43/7/13 (Item 13 from file: 350) [Links](#)

Derwent WPIX

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0014283776 *Drawing available*

WPI Acc no: 2004-470347/200445

XRPX Acc No: N2004-371705

*MAILED LATE  
DST*

**Osteosynthesis plate for smaller bones e.g. carpal bones, has central hole with diameter adjusted to that of positioning pin for engaging running plate on pin, and landmark situated at level of plate periphery**

Patent Assignee: FIXANO (FIXA-N); FIXANO SA (FIXA-N); MARTIN J (MART-I); MATHOULIN C (MATH-I)

Inventor: MARTIN J; MARTIN J J; MATHOULIN C

Patent Family ( 6 patents, 105 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
FR 2848413	A1	20040618	FR 200215614	A	20021211	200445	B
WO 2004062515	A1	20040729	WO 2003FR3129	A	20031022	200451	E
AU 2003285433	A1	20040810	AU 2003285433	A	20031022	200479	E
EP 1575434	A1	20050921	EP 2003778434	A	20031022	200562	E
			WO 2003FR3129	A	20031022		
JP 2006509606	W	20060323	WO 2003FR3129	A	20031022	200623	E
			JP 2004566077	A	20031022		
US 20060149249	A1	20060706	WO 2003FR3129	A	20031022	200645	E
			US 2005538809	A	20051223		

Priority Applications (no., kind, date): FR 200215614 A 20021211

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
FR 2848413	A1	FR	14	11		
WO 2004062515	A1	FR				
National Designated States,Original		AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW				
Regional Designated States,Original		AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW				
AU 2003285433	A1	EN			Based on OPI patent	WO 2004062515
EP 1575434	A1	FR			PCT Application	WO 2003FR3129
					Based on OPI patent	WO 2004062515
Regional Designated States,Original	AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR					

JP 2006509606	W	JA	18	PCT Application	WO 2003FR3129
				Based on OPI patent	WO 2004062515
US 20060149249	A1	EN		PCT Application	WO 2003FR3129

### **Alerting Abstract FR A1**

**NOVELTY** - The plate has lateral holes for fixing a screw (6) for its fixation to small neighboring carpal bones (2 to 5). A central hole has its diameter adjusted to that of a positioning pin, for permitting the engagement of a running plate (1) on the positioning pin. The pin is fixed in one of the bones or between the bones to be healed. A landmark (18) is situated at a level of plate periphery.

**DESCRIPTION** - An INDEPENDENT CLAIM is also included for an instrument set for fixing an osteosynthesis plate.

**USE** - Used for osteosynthesis of small neighboring bones e.g. carpal bones, to each other.

**ADVANTAGE** - The positioning pin facilitates for precise and easy positioning of the plate and the landmark eliminates the risk of fixing a screw between two bones.

**DESCRIPTION OF DRAWINGS** - The drawing shows a perspective view of an osteosynthesis plate.

1 Running plate

2-5 Bones

6 Screw

18 Landmark

25 Mark

**Title Terms /Index Terms/Additional Words:** OSTEOSYNTHESIS; PLATE; SMALLER; BONE; CENTRAL; HOLE; DIAMETER; ADJUST; POSITION; PIN; ENGAGE; RUN; LANDMARK; SITUATE; LEVEL; PERIPHERAL



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(19) United States

(12) Patent Application Publication

Mathoulin et al.

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(43) Pub. Date: Jul. 6, 2006

(54) OSTEOSYNTHESIS PLATE FOR THE  
OSTEOSYNTHESIS OF SMALL  
NEIGHBOURING BONES

Publication Classification

(51) Int. Cl.  
A61F 2/30 (2006.01)

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(52) U.S. Cl. ..... 606/69

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(57) ABSTRACT

(21) Appl. No.: 10/538,809

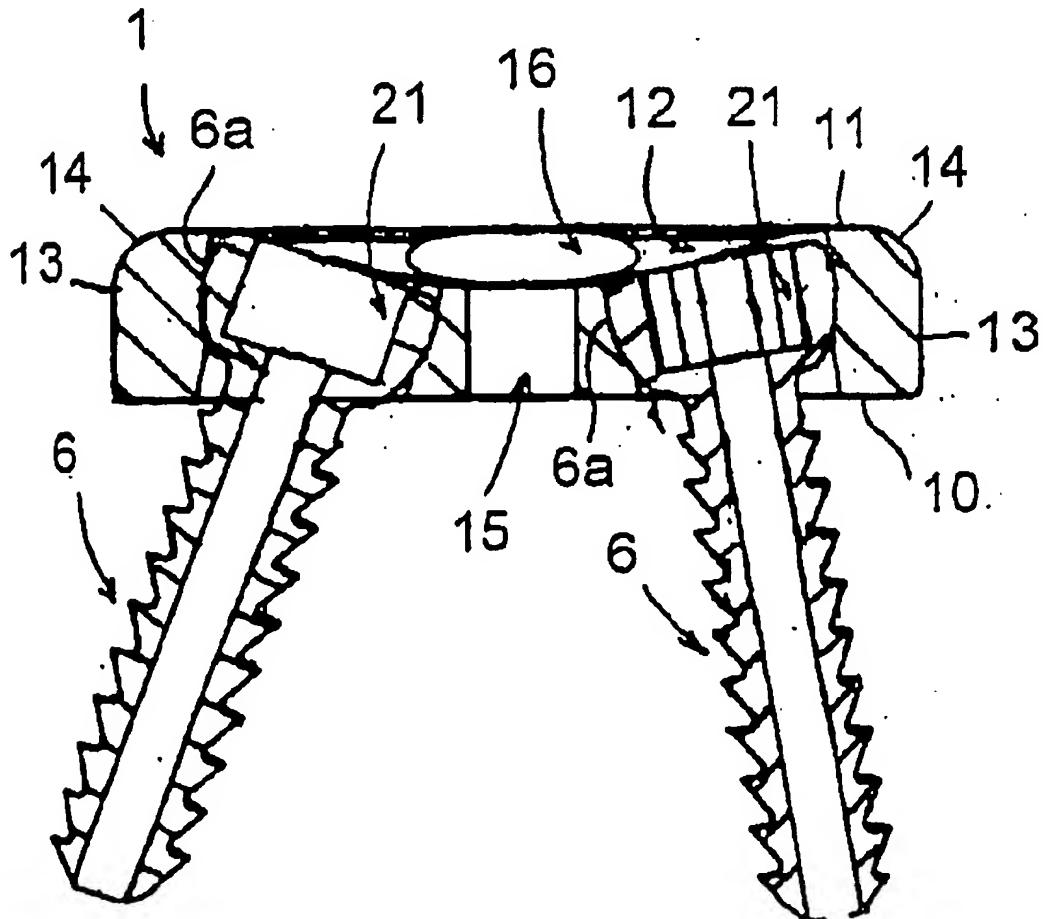
The invention relates to an osteosynthesis plate for the osteosynthesis of small neighbouring bones. The inventive osteosynthesis plate (1) is dimensioned such that it can be positioned above the bones to be treated without resting on the larger neighbouring bones. According to the invention, the osteosynthesis plate comprises lateral holes (16) for the insertion of screws (6) which are used to fix same to the bones (2 to 5). The plate is characterised in that: (i) it comprises a flat face (10) which is intended to come into contact with the bones to be treated; and (ii) it comprises holes (16) for receiving screws (6), which have axes that are inclined in relation to the aforementioned flat face (10) and which are designed such that the inserted screws diverge towards the outside of the plate (1).

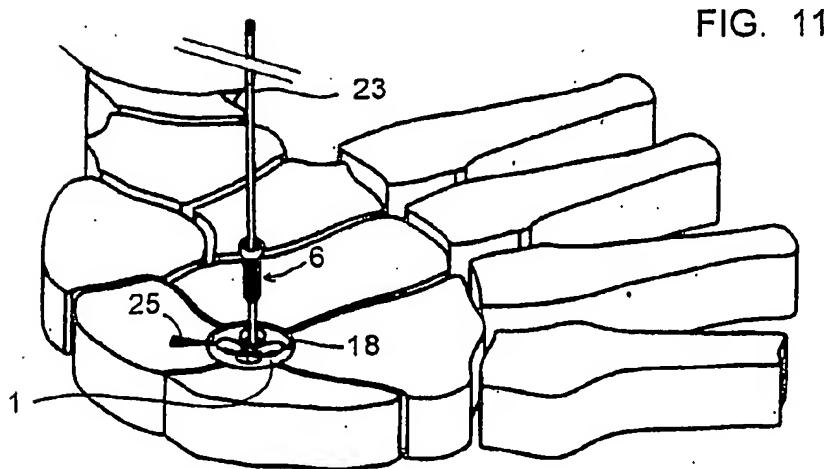
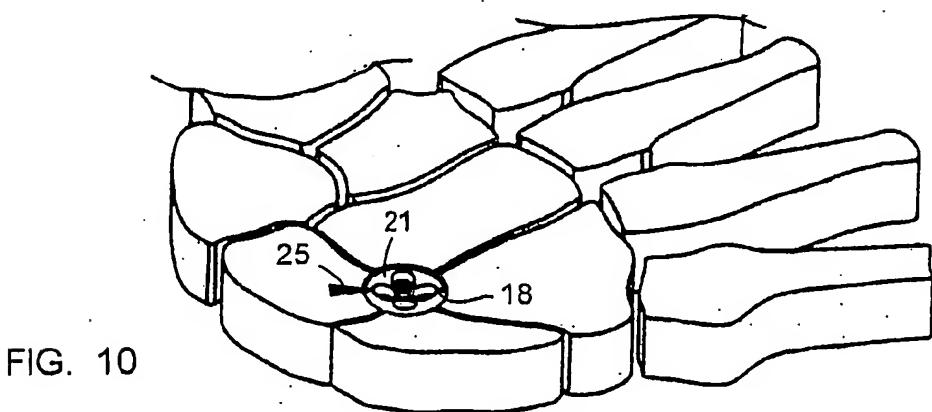
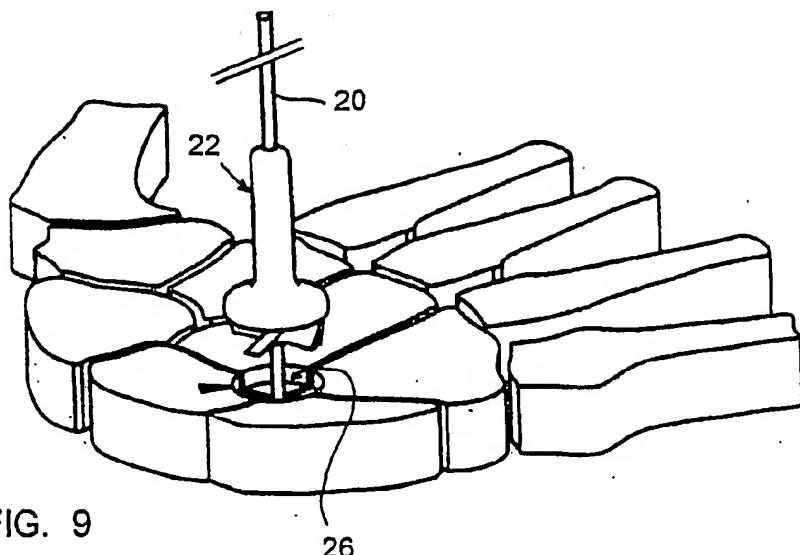
(22) PCT Filed: Oct. 22, 2003

(86) PCT No.: PCT/FR03/03129

(30) Foreign Application Priority Data

Dec. 11, 2002 (FR) ..... 02/15614





identical to those of such plate, has a hollowed countersink reamer 22, visible on FIG. 9, and spindles 23 for guiding the screws 6.

[0052] Practically, as represented on FIG. 7, the dummy piece 21 is positioned on the bones to be treated 2 to 5 and is oriented angularly so that the holes 16 contained therein match at best each bone 2 to 5. A mark 25 is then provided on one of the bones to be treated by means of an electric surgical knife, facing the mark 18 of the dummy piece 21.

[0053] The dummy piece 21 is held in this position, then the spindle 20 is placed through the hole 15 of such dummy piece, as represented on FIG. 8. The dummy piece 21 is then withdrawn by sliding along said spindle 20.

[0054] The countersinking reamer 22 is then inserted on the spindle 20 and is used for providing a countersink 26 coaxial to said spindle 20, as represented on FIG. 9.

[0055] The spindle 20 is withdrawn then the plate 1 is inserted in said countersink 26. The adequate position of this plate 1 determined by means of the dummy piece 21 can be found easily by matching the mark 18 contained in said plate 1 opposite the mark 25, as illustrated on FIG. 10.

[0056] The spindles 23 are then inserted one by one into the bones for guiding each screw 6 in the matching hole 16, as shown on FIG. 11.

[0057] The invention provides a plate for the osteosynthesis of small neighbouring bones, in particular bones of the carpus, whereof the implantation is made easier by the features of such plate and by the set of instruments 20 to 23 enabling the insertion thereof. Such plate eliminates moreover, or at least reduces very significantly, the risk of inserting a screw between two bones, thanks to accurate positioning of such plate made possible by said spindle 20 and said mark 18.

[0058] It goes without saying that the plate might exhibit any other form, without modifying the object of the present invention in any way.

[0059] It should be understood that the preceding description has only been given for exemplification purposes and that it does not limit the field of the invention without departing from the execution details described by any other equivalent.

1. Osteosynthesis plate for osteosynthesis of small neighbouring bones, in particular wrist bones, having dimensions such that it may be placed above the bones to be treated, without resting on larger neighbouring bones, and comprising lateral holes for inserting screws to fix the latter to such bones characterized in that it comprises a face intended to come into contact with the bones to be treated which is flat, and comprises holes for receiving screws having axes that are tilted in relation to said flat face, such holes being designed such that the screws, once inserted into said holes, diverge towards the outside of the plate.

2. Osteosynthesis plate according to claim 1, characterized in that it is circular in shape.

3. Osteosynthesis plate according to claim 1, characterized in that its face opposite to that coming into contact with the bones to be treated exhibits a recess enabling to lower the heads of the screws with respect to the plate in implanting position thereof.

4. Osteosynthesis plate according to claim 3, characterized in that the recess occupies the major portion of said face of the plate opposite to that coming into contact with the bones to be treated, and is in the form of a hollow spherical cap.

5. Osteosynthesis plate according to claim 1, characterized in that at least one screw hole is in the form of a hollow spherical section, and in that the head of at least one screw exhibits a side wall in the form of matching spherical section, these respective shapes of the hole and of the screw head enabling multidirectional orientation of the screw with respect to the plate.

6. Osteosynthesis plate according to claim 1, characterized in that it comprises a number of screw holes equal to the number of bones to be treated, or close to such number, in particular four holes to perform, when dealing with wrist bones, osteosynthesis of the bone capitatum, of the semilunar bone, of the cuneiform bone and of the unciform bone.

7. Osteosynthesis plate according to claim 1, characterized in that it comprises a central hole of diameter adjusted to that of a positioning spindle, enabling the sliding engagement of the plate on said spindle, and a mark situated at the periphery thereof.

8. Set of instruments for the insertion of the osteosynthesis plate according to claim 1, characterized in that it comprises a reamer.

9. Set of instruments according to claim 8, characterized in that it comprises a positioning spindle, enabling the sliding engagement of the plate on said spindle.

10. Set of instruments according to claim 8, characterized in that it comprises a dummy of the plate, i.e. a test piece identical in shape to that of the plate, provided with a mark identical to that of the plate.

11. Set of instruments according to claim 10, characterized in that the dummy provides with a hole identical to that of the plate, enabling to engage this dummy on said positioning spindle.

12. Set of instruments according to claim 9, characterized in that the reamer is hollowed and may be engaged by sliding, but with a tight fit, on said positioning spindle.

13. Set of instruments for the insertion of the osteosynthesis plate according to claim 2, characterized in that it comprises a reamer.

14. Set of instruments for the insertion of the osteosynthesis plate according to claim 3, characterized in that it comprises a reamer.

15. Set of instruments for the insertion of the osteosynthesis plate according to claim 4, characterized in that it comprises a reamer.

16. Set of instruments for the insertion of the osteosynthesis plate according to claim 5, characterized in that it comprises a reamer.

17. Set of instruments for the insertion of the osteosynthesis plate according to claim 6, characterized in that it comprises a reamer.

18. Set of instruments for the insertion of the osteosynthesis plate according to claim 7, characterized in that it comprises a reamer.

\* \* \* \* \*

43/7/34 (Item 34 from file: 350) [Links](#)

Derwent WPIX

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WPI Acc no: 2002-723767/200278

Related WPI Acc No: 2002-707886

XRPX Acc No: N2002-570635

**Interbody spinal fusion implant device for promoting spinal fusion between neighbouring vertebrae, used in orthopaedic procedures**

Patent Assignee: RAPP L G (RAPP-I)

Inventor: RAPP L G

Patent Family ( 3 patents, 98 countries )

Patent Number	Kind	Date	Application Number		Kind	Date	Update	Type
WO 2002080823	A1	20021017	WO 2002US10699		A	20020404	200278	B
AU 2002258720	A1	20021021	AU 2002258720		A	20020404	200433	E
US 20040186570	A1	20040923	WO 2002US10699		A	20020404	200463	E
			US 2004475456		A	20040308		

Priority Applications (no., kind, date): US 2001381579 P 20010404

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
WO 2002080823	A1	EN	21	3		
National Designated States,Original		AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM ZW				
Regional Designated States,Original		AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW				
AU 2002258720	A1	EN			Based on OPI patent	WO 2002080823
US 20040186570	A1	EN			PCT Application	WO 2002US10699

#### Alerting Abstract WO A1

**NOVELTY** - The device (10) includes a pair of plate members (12,14) having flat support plates (18,36) for contacting and resting against the softer central cancellous bone portion of respective end plates of adjacent vertebrae.

**DESCRIPTION** - The support plates have a front template portion (27,44) that is orthogonal to the flat support plate and is bent in a direction to communicate with the anterior surface of the hard cortical endplate of the respective vertebrae. The flat support plates are provided with a central channel (56) in which a support strut (55)

may be placed. The support is configured to vary the distance between the support **plates** such that the height of the apparatus proximate the anterior end is greater than the height of the device at the posterior end whereby the natural lordosis of the spine is maintained after the apparatus is installed.

**USE** - An interbody spinal fusion device for promoting the fusion of two adjacent vertebrae, during spinal implant **orthopaedic** procedures.

**ADVANTAGE** - Decreases the risk of subsidence and provides a larger area of contact between the **bone** graft material and adjacent vertebrae. Maintains normal lordosis.

**DESCRIPTION OF DRAWINGS** - The drawing is a perspective view of an interbody spinal fusion device.

10 the implant device

12,14 **plate** members

18,36 flat support **plates**

27,44 front **template** portion

55 support strut

56 central channel

**Title Terms /Index Terms/Additional Words:** SPINE; FUSE; IMPLANT; DEVICE; PROMOTE; NEIGHBOURING; VERTEBRA; **ORTHOPAEDIC**; PROCEDURE

#### **Class Codes**

##### International Patent Classification

<b>IPC</b>	<b>Class Level</b>	<b>Scope</b>	<b>Position</b>	<b>Status</b>	<b>Version Date</b>
<b>A61F-002/44</b>			Main		"Version 7"
<b>A61B-017/17; A61B-017/70; A61F-002/46</b>			Secondary		"Version 7"

US Classification, Issued: 623017110

File Segment: EngPI; ;

DWPI Class: P31; P32

#### **Original Publication Data by Authority**

#### **Australia**

**Publication No.** AU 2002258720 A1 (Update 200433 E)

**Publication Date:** 20021021

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**Inventor:** RAPP L G

**Language:** EN

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**Priority:** US 2001381579 P 20010404

**Related Publication:** WO 2002080823 A (Based on OPI patent )

# United States

Publication No: US 20040186570 A1 (Update 200463 E)

Publication Date: 20040923

## Interbody spinal fusion device

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Language: EN

Application: WO 2002US10699 A 20020404 (PCT Application)

US 2004475456 A 20040308 (Local application)

Priority: US 2001381579 P 20010404

Original IPC: A61F-2/44(A)

Current IPC: A61F-2/44(A)

Original US Class (main): 62317.11

Original Abstract: A spinal fusion implant device (10), and method of use, for promotes device for promoting a spinal fusion between neighboring vertebrae. The spinal fusion device may be located within the intervertebral disc space and includes a pair of plate member (12, 14) that preferably have flat support plates (18, 36) for contacting and resting against the softer, central cancellous bone portion of respective endplates of adjacent vertebrae. The support plates have a front template portion (27, 44) that is substantially orthogonal to the flat support plate and is bent in a direction to communicate with the anterior surface of the hard cortical endplate the respective vertebrae. The flat support plates are provided with a central channel (56) in which a support strut (55) may be placed. The support is configured to vary the distance between the support plates such that the height of the apparatus proximate the anterior end is greater than the height of the device at the posterior end whereby the natural lordosis of the spine is maintained after the apparatus is installed. The support strut may be selected from a set of support struts of predetermined height and angle, to alter the vertical distance between the support plates to customize the apparatus to fit a given patient. Channels formed (66, 67), on either side of the support strut, are filled with bone graft material and contact the endplates of the vertebrae through large openings (25, 26, 43, 45) in the flat support plates to facilitate fusion.

Claim: What is claimed is:

1. An interbody spinal fusion device for facilitating fusion between adjacent vertebrae of a human spine, the interbody spinal fusion device comprising:
  - a pair of bone-engaging plate members adapted to engage respective ones of the vertebrae, and to be accommodated therebetween, for maintaining the respective vertebrae in a predetermined spaced apart relationship, the interbody fusion device having an anterior end distal from a posterior end, the bone-engaging plate members each having;
  - a support plate configured to communicate intimately with an endplate of an associated one of the adjacent vertebrae, the support plate having an outer surface that contacts the associated vertebra and an inner surface directed toward the other of the adjacent vertebrae, the support plate having apertures therethrough and at least one longitudinal support plate portion extending substantially through the support plate from the anterior end thereof to the posterior end thereof, and
  - a generally curved template having a first template surface extending outward substantially orthogonal with respect to the horizontal plane of the support plate in the direction of the outer surface of the support plate, the first template surface facing in the posterior direction and arranged for communicating with a

substantially lateral anterior cortical surface portion of the associated vertebra, the template further having an anterior surface; and

- a support strut interposed between respective inner surfaces of the bone-engaging plate members, said support strut being arranged to extend substantially parallel to the longitudinal support plate portion, the support strut being adapted to maintain the bone-engaging plate members apart in a predetermined spatial relationship wherein a distance between the respective inner surfaces proximate the anterior end is greater than the distance proximate the posterior end, whereby a substantially natural lordosis of the human spine is maintained.

## WIPO

**Publication No.** WO 2002080823 A1 (Update 200278 B)

**Publication Date:** 20021017

### **INTERBODY SPINAL FUSION DEVICE**

### **DISPOSITIF DE FUSION INTERVERTEBRALE**

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**Language:** EN (21 pages, 3 drawings)

**Application:** WO 2002US10699 A 20020404 (Local application)

**Priority:** US 2001381579 P 20010404

**Designated States:** (National Original) AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM ZW

(Regional Original) AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW

**Original IPC:** A61F-2/44(A) A61B-17/17(B) A61B-17/70(B) A61F-2/46(B)

**Current IPC:** A61F-2/44(A) A61B-17/17(B) A61B-17/70(B) A61F-2/46(B)

**Original Abstract:** A spinal fusion implant device (10), and method of use, for promoting a spinal fusion between neighboring vertebrae. The spinal fusion device may be located within the intervertebral disc space and includes a pair of plate member (12, 14) that preferably have flat support plates (18, 36) for contacting and resting against the softer, central cancellous bone portion of respective endplates of adjacent vertebrae. The support plates have a front template portion (27, 44) that is substantially orthogonal to the flat support plate and is bent in a direction to communicate with the anterior surface of the hard cortical endplate the respective vertebrae. The flat support plates are provided with a central channel (56) in which a support strut (55) may be placed. The support is configured to vary the distance between the support plates such that the height of the apparatus proximate the anterior end is greater than the height of the device at the posterior end whereby the natural lordosis of the spine is maintained after the apparatus is installed. The support strut may be selected from a set of support struts of predetermined height and angle, to alter the vertical distance between the support plates to customize the apparatus to fit a given patient. Channels formed (66, 67), on either side of the support strut, are filled with bone graft material and contact the endplates of the vertebrae through large openings (25, 26, 43, 45) in the flat support plates to facilitate fusion.



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Rapp

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(54) INTERBODY SPINAL FUSION DEVICE

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(30) Foreign Application Priority Data

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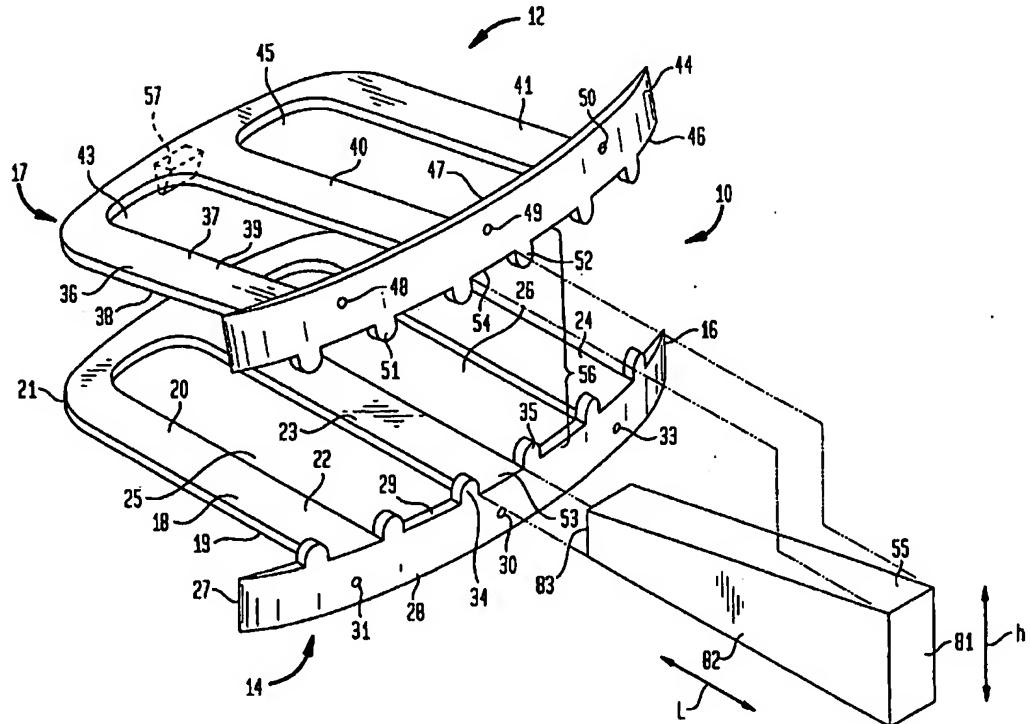
Publication Classification

(51) Int. Cl.<sup>7</sup> ..... A61F 2/44  
(52) U.S. Cl. ..... 623/17.11

(57) ABSTRACT

A spinal fusion implant device (10), and method of use, for promotes device for promoting a spinal fusion between

neighboring vertebrae. The spinal fusion device may be located within the intervertebral disc space and includes a pair of plate member (12, 14) that preferably have flat support plates (18, 36) for contacting and resting against the softer, central cancellous bone portion of respective endplates of adjacent vertebrae. The support plates have a front template portion (27, 44) that is substantially orthogonal to the flat support plate and is bent in a direction to communicate with the anterior surface of the hard cortical endplate the respective vertebrae. The flat support plates are provided with a central channel (56) in which a support strut (55) may be placed. The support is configured to vary the distance between the support plates such that the height of the apparatus proximate the anterior end is greater than the height of the device at the posterior end whereby the natural lordosis of the spine is maintained after the apparatus is installed. The support strut may be selected from a set of support struts of predetermined height and angle, to alter the vertical distance between the support plates to customize the apparatus to fit a given patient. Channels formed (66, 67), on either side of the support strut, are filled with bone graft material and contact the endplates of the vertebrae through large openings (25, 26, 43, 45) in the flat support plates to facilitate fusion.



[0029] At anterior end 16, longitudinal members 22, 23, and 24 terminate with a generally curved section that is bent substantially orthogonal to the horizontal plane of bottom support plate 18 in the direction of communication of the template and the vertebral body. The generally curved section is herein referred to as bottom template 27. Bottom template 27 has an anterior front face surface 28 at anterior side 16 of the device and an opposing posterior surface 29 (designated, but not specifically shown in this figure). Posterior surface 29 is adapted to contact and rest flush against the curved anterior cortical surface of the lower vertebra (not shown).

[0030] In this embodiment, bottom template 27 is provided with three pre-drilled holes 31, 32 and 33 which may, in some embodiments, be internally threaded. Fasteners, such as threaded orthopedic bone screws (not shown) are inserted through the pre-drilled holes and into the hard cortical bone of the anterior surface of the vertebra. In preferred embodiments, the pre-drilled holes may be configured to adjust the angle of placement of the bone screws so that the bone screws can be set to work against each other in order to stabilize the device.

[0031] While a total of six bone screws are used in the specific embodiment described herein, it is to be understood that the bone-engaging plate members can be attached to vertebrae using a greater or lesser number of fasteners depending on different variables, including, but certainly not limited to, size or bone density of the vertebrae, spatial positioning of the vertebrae, and the level of attachment required by the physician.

[0032] Orthopedic bone screws of the type suggested for use in the practice of the invention are well-known and available from a variety of suppliers known to those of ordinary skill in the art. However, it is to be understood, that other known or new and improved forms of orthopedic screws and other types of improved orthopedic fasteners and fastening systems are within the contemplated scope of the invention.

[0033] Top plate member 12 is generally equivalent in structure to bottom plate member 14, and in some embodiments, may be identical in structure to bottom plate member.

[0034] However, in use, the top plate member 12 is flipped so that top template 44 will be bent substantially orthogonal to the horizontal plane of top support plate 36 in the direction of communication of the template and the vertebral body.

[0035] Referring to FIG. 1, top plate member 12 has a top support plate 36 that is adapted to rest on the endplate of the upper vertebra (not shown). Top support plate 36 has an outer surface 37 that contacts the upper vertebra and an inner surface 38 (designated, but not specifically shown in this figure). Top support plate 36 has three longitudinal members 39, 40, and 41 that terminate in a generally curved section 42 at posterior end 17. Longitudinal members 39, 40 and 41 define two large openings 43 and 45. At anterior end 16, longitudinal members 39, 40 and 41 terminate with top template 44. Top template 44 has an anterior front face surface 46 at anterior side 16 of the device and an opposing posterior surface 47 (designated, but not specifically shown). Posterior surface 47 is adapted to contact and rest flush against the curved anterior cortical surface of the upper

vertebra (not shown). Top template 44 is also provided with three pre-drilled holes 48, 49, 50.

[0036] Bottom template 27 has tabs, illustratively adjacent tabs 34 and 35, that are integrally formed, and coplanar with, the anterior front face of bottom template 27, but extend in a direction opposite to the direction that the template is bent. For bottom template 27, the tabs extend upward from its inner surface 20. Tabs 34 and 35 form an initial guide, or slot 53, that precludes transverse dislocation of support strut 55 when inserted into the interbody spinal fusion device. In this specific embodiment, the tabs are spaced apart to define an opening having a width approximately equal to the width of central longitudinal member 23. Top template 44 also has tabs, illustratively tabs 51 and 52, that define a slot 54. However, in the case of top template 44, the tabs extend in a direction downward from its inner surface 38. When top plate member 12 and bottom plate member 14 are mounted to adjacent vertebrae, as will be described hereinbelow, tabs 34 and 35 in combination with tabs 51 and 52, are aligned to form generally an aperture 56 into which wedge-shaped support strut 55 is inserted.

[0037] In addition to the foregoing, in some embodiments additional tabs (shown, but not specifically designated, in FIG. 1) may be provided. In these embodiments, the tabs can operate to define additional slots/apertures for the insertion of more than one support strut. The tabs, which extend in an opposing direction to the main body of the template, and in front of the channels into which one graft material will be placed, can also operate to stabilize and anchor the device.

[0038] The interbody spinal fusion device 10 has a height that is defined by the vertical distance between the outer surface 39 of top support plate 36 and the outer surface 19 of bottom support plate 18. The height is adjustable by selection and insertion of a strut of the appropriate size into aperture 56, and preferably, varies along the interbody spinal fusion device 10 between anterior end 16 and posterior end 17 so as to maintain the natural lordosis of the spine.

[0039] Referring to exemplary strut 55, shown in FIG. 1 prior to insertion, support strut 55 comprises a solid wedge-shaped object of a predetermined maximum height at anterior end 81 and minimum height at posterior end 83. The angle of the wedge-shaped strut is determined by the height of posterior end 83 relative to the height of anterior end 81. In a kit embodiment of the invention, a selection of support struts of varying height and/or angle would be provided along with the top and bottom plate members in a surgical kit so that the practitioner can select the appropriate strut for the individual patient. The angle of support strut 55 is chosen to maintain the lordosis of the vertebral column. The height of support strut 55 is chosen to approximate the height of the disc material that previously occupied the intervertebral spacing. It is anticipated that as few as two or three support struts will be all that is required to practice the invention. Of course, this number is illustrative and is in no way intended to be limiting. This is a significant reduction in the amount of parts required for a surgical kit for an interbody fusion operation.

[0040] In use, support strut 55 is inserted in aperture 56 between longitudinal members 23 and 40, spanning the intervertebral region and resting firmly against the upper and lower vertebrae. In some embodiments, top plate 36 has a

material may be packed. In addition, there large openings in the support plate provides for a large area of contact between the bone graft material and the prepared endplates of the vertebrae.

[0052] Although the invention has been described in terms of specific embodiments and applications, persons skilled in the art can, in light of this teaching, generate additional embodiments without exceeding the scope or departing from the spirit of the invention described herein. Accordingly, it is to be understood that the drawing and description in this disclosure are proffered to facilitate comprehension of the invention, and should not be construed to limit the scope thereof.

What is claimed is:

1. An interbody spinal fusion device for facilitating fusion between adjacent vertebrae of a human spine, the interbody spinal fusion device comprising:

a pair of bone-engaging plate members adapted to engage respective ones of the vertebrae, and to be accommodated therebetween, for maintaining the respective vertebrae in a predetermined spaced apart relationship, the interbody fusion device having an anterior end distal from a posterior end, the bone-engaging plate members each having;

a support plate configured to communicate intimately with an endplate of an associated one of the adjacent vertebrae, the support plate having an outer surface that contacts the associated vertebra and an inner surface directed toward the other of the adjacent vertebrae, the support plate having apertures therethrough and at least one longitudinal support plate portion extending substantially through the support plate from the anterior end thereof to the posterior end thereof, and

a generally curved template having a first template surface extending outward substantially orthogonal with respect to the horizontal plane of the support plate in the direction of the outer surface of the support plate, the first template surface facing in the posterior direction and arranged for communicating with a substantially lateral anterior cortical surface portion of the associated vertebra, the template further having an anterior surface; and

a support strut interposed between respective inner surfaces of the bone-engaging plate members, said support strut being arranged to extend substantially parallel to the longitudinal support plate portion, the support strut being adapted to maintain the bone-engaging plate members apart in a predetermined spatial relationship wherein a distance between the respective inner surfaces proximate the anterior end is greater than the

distance proximate the posterior end, whereby a substantially natural lordosis of the human spine is maintained.

2. The interbody spinal fusion device of claim 1 wherein the support plate is generally flat.

3. The interbody spinal fusion device of claim 1 wherein the support plate is adapted to follow generally the contour of the endplate of the vertebra with which it communicates.

4. The interbody spinal fusion device of claims 1 and 2 wherein the support plate comprises three longitudinal members that define two large apertures through the support plate.

5. The interbody spinal fusion device of claim 4 wherein the longitudinal members terminate in a generally curved section at the posterior end, and terminate with the template at the anterior end.

6. The interbody spinal fusion device of claim 1 wherein the anterior surface of at least one template is provided with at least three apertures for accommodating fasteners.

7. The interbody spinal fusion device of claim 7 wherein the apertures are configured to determine the angle of penetration of the fasteners into each vertebra.

8. The interbody spinal fusion device of claims 6 and 7 wherein the fasteners are orthopedic bone screws.

9. The interbody spinal fusion device of claim 1 wherein the support plate further includes at least two tabs that are integrally formed, and coplanar, with the anterior surface of the template, and extend in the direction of the inner surface of the support plate.

10. The interbody spinal fusion device of claim 9 wherein the support plate is provided with two adjacent tabs for guiding the support strut between the bone-engaging plate members during placement.

11. The interbody spinal fusion device of claim 10 wherein said two adjacent tabs define an opening having a width approximately equal to the width of the support strut.

12. The interbody spinal fusion device of claim 1 wherein at least one of the support plates includes a protuberance on the inner surface of the longitudinal member proximate the posterior end to preclude over-insertion of the support strut in the posterior direction.

13. The interbody spinal fusion device of claim 1 further including bone graft material packed into channels formed on either side of the support strut and extending between the support plates, the bone graft material communicating with the vertebrae through the openings in the support plates.

14. The interbody spinal fusion device of claim 1 wherein there is further provided an end cap proximate the anterior end.

15. The interbody spinal fusion device of claim 1 wherein the support strut is wedge-shaped.

\* \* \* \* \*

43/7/11 (Item 11 from file: 350) [Links](#)

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0014364834 *Drawing available*

WPI Acc no: 2004-553576/200453

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*Some Decent*  
*Claim language - May*  
*be a care date -*

**Plating system for fixing bone in mammals, has two plate segment affixed onto bone structure with another bone structure in aligned spatial relationship, coupler unit to adjust movements of aligned bone structures**

Patent Assignee: ABDOU M S (ABDO-I); ABDOU S M (ABDO-I)

Inventor: ABDOU M S; ABDOU S M

Patent Family ( 2 patents, 106 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
WO 2004062482	A2	20040729	WO 2004US567	A	20040110	200453	B
US 20040204713	A1	20041014	US 2003439030	P	20030110	200468	E
			US 2003683325	A	20031010		
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Priority Applications (no., kind, date): US 2004755080 A 20040110; US 2003683325 A 20031010; US 2003439030 P 20030110

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes			
WO 2004062482	A2	EN	53	17				
National Designated States,Original	AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW							
Regional Designated States,Original	AT BE BG BW CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW							
US 20040204713	A1	EN			Related to Provisional	US 2003439030		
					C-I-P of application	US 2003683325		

### Alerting Abstract WO A2

**NOVELTY** - A plating system (I) for bone fixation for mammalian bone structures, has first and second plate segment, each of segments are affixed onto bone structure with another bone structure in aligned spatial relationship, coupler unit (coupling segment) being securable to first and second plate segment, is selectively adjustable to define movement (compression and subsidence) of bone structures in aligned spatial relationship.

**DESCRIPTION** - A plating system (I) for bone fixation for mammalian bone structures, comprises a first plate

segment and a second **plate** segment, each of the segments adapted to be affixed onto a **bone** structure with another **bone** structure in an aligned spatial relationship, a coupler unit (coupling segment) being securable to the first **plate** segment and the second **plate** segment, the coupler unit being selectively **adjustable** to define the **movement** (compression and subsidence) of the **bone** structures in the aligned spatial relationship.

USE - (I) is useful for fixing mammalian **bone** structures, which involves implanting a first prosthetic device and a second prosthetic device at predefined locations along the anatomically desired plane of the **bone** structures, securing a first **plate** segment and a second **plate** segment onto the first and the second prosthetic devices, respectively, and attaching a coupler to the first **plate** segment and the second **plate** segment, where the coupler is selectively **adjustable** to define **movement** of the **bone** structures in the aligned spatial relationship. The method further involves securing first **plate** segment and the second **plate** segment to the **bone** structures. The prosthetic device includes a portion of a distraction screw. The anatomically desired plane of the **bone** structures comprises the centerline of the **bone** structures. The securing step further involves, compressing a portion of the prosthetic device, placing a portion of each **plate** segment between the **bone** structure and the compressed portion of the prosthetic device, and decompressing the portion of the prosthetic device to secure the **plate** segment between the **bone** structure and the prosthetic device. The coupler is **adjustable** to maintain compression of the **bone** structures, and to allow subsidence of the **bone** structures. (I) is useful for fixing mammalian **bone** structures, which involves positioning a first and second distraction screw on at least two mammalian **bone** structures, respectively, each of the distraction screws comprises a proximal segment (130) having an elongated body with an internal bore extending through the length of the elongated body, an deployable member disposed within the internal bore of the elongated body and adapted to be retractably deployed outside the internal bore and a prosthetic device including a head portion (122,1362) and a threaded shank portion and being detachably coupled to the elongated body, **rotatably manipulating** the distraction screws to effect the threading and affixation of the shank portions of the prosthetic devices onto the mammalian **bone** structures, detaching the elongated member segments from the prosthetic devices on the respective mammalian **bone** structures, and securing onto the first prosthetic device and the second prosthetic device, respectively a first **plate** segment and a second **plate** segment, each of the segments being aligned in a spatial relationship and securing a coupler unit (coupling segment) to the first **plate** segment and the second **plate** segment, the coupler unit being selectively **adjustable** to define the **movement** (compression and subsidence) of the **bone** structures in the aligned spatial relationship. The mammalian **bone** structure is a cancerous **bone** or cortical **bone**. The plating segments are constructed with a biologically adaptable or biologically compatible material. The biologically adaptable or biologically compatible material is stainless steel, titanium, combination metallic alloys, plastics, ceramics, **osteo-conductive** materials, and bioactive materials. The **osteo-conductive** material is demineralized **bone** matrix, hydroxyapatite, a transforming growth factor, platelet-derived growth factor or **bone-morphogenic** protein (all claimed).

ADVANTAGE - (I) provides ease of use, reliable **bone** fixation, adjustable length, modular design, and the ability to accommodate and control **bone** settling. (I) maximizes the likelihood of proper **plate** placement, avoid maneuvers that weaken the vertebral bodies.

DESCRIPTION OF DRAWINGS - The figure shows partial side view of a disassembled distraction screw.

110 modular distraction screw

120 distal segment

122,1362 head

124 threaded shank portion

126 threads of shank portion

128,1225 threads

130 removable proximal segment

132 elongated body

136 member

180 proximal portion

1222 upper aspect of circular head

1223 lower portion of the head

1224 edge

### Technology Focus

BIOTECHNOLOGY - Preferred System: In (I) the coupler unit is selectively **adjustable** to enable compression and subsidence of the **bone** structures in the aligned spatial relationship. The **plates** are slidably engaged substantially in the aligned spatial relationship. Each of the **plates** has a projection portion and a receiving channel for complementary placement of the projection portion of one **plate** segment into the receiving channel of another **plate** segment. The first **plate** segment has at least one projection portion and the second **plate** segment has at least one receiving channel to receive the projection portion of first **plate** segment. The projection portion has a generally elongated body (132) with cross-section shape such as triangle, truncated triangle, rectangle, modified rectangle or trapezoid. The coupler unit is selectively engaged with first **plate** segment and the second **plate** segment to secure one or both the **plate** segments to define the **movement** of the **bone** structures in the aligned spatial relationship. The coupler unit comprises an elongated element and a several fasteners for selectively engaging the plating segments. The coupler unit has an opening to receive at least one fastener passing through it to engage one or both of the **plate** segments. The coupler unit comprises stepped channel openings formed on the first **plate** segment and the second **plate** segment and arranged in a substantially overlapping relationship and defining an internal travel pathway between the first and the second **plate** segments, a bolt element having a threaded shank portion (124) passing through the stepped channel openings with locking mechanisms at the ends of the shank to secure the **plate** segments, and a frictional element fitted in the internal travel pathway and engageable by the treaded shank portion to couple the bolt element to either the first **plate** segment or the second **plate** segment. The frictional element has threads cooperating with, and carried by the threaded shank portion of the bolt element to effect the selective engagement of the first **plate** segment or the second **plate** segment. The bolt element and the openings of the stepped channels are of substantially similar width. A portion of the frictional element and the internal travel pathway are of substantially similar width. The channel of the first **plate** segment has an enlarged opening defining a keyhole shape adapted to accept the locking mechanism including the bolt element passing through it between a first position outside the channel opening of the first **plate** segment to affix the spatial relationship of the **plate** segments in compression and a second position of the retainer within the internal travel pathway and enabling the relative **movement** of the first **plate** segment and the second **plate** segment for **bone** subsidence. The **plate** segments has at least one opening to accommodate a **bone** screw for securing the **plate** segments onto the **bone** structures. The **plate** segments has at least one opening to receive a portion of a distraction screw implanted at a predetermined **landmark** of the **bone** structure. The **plate** segments has curved surfaces to conform to the surface contours of the **bone** structures. The **plate** further comprises an end coupler adaptable to be engaged by a distraction screw. The end coupler includes unit for engagement with the distraction screw comprising interfitting threads or complementary spines.



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(54) PLATING SYSTEM FOR BONE FIXATION  
AND SUBSIDENCE AND METHOD OF  
IMPLANTATION

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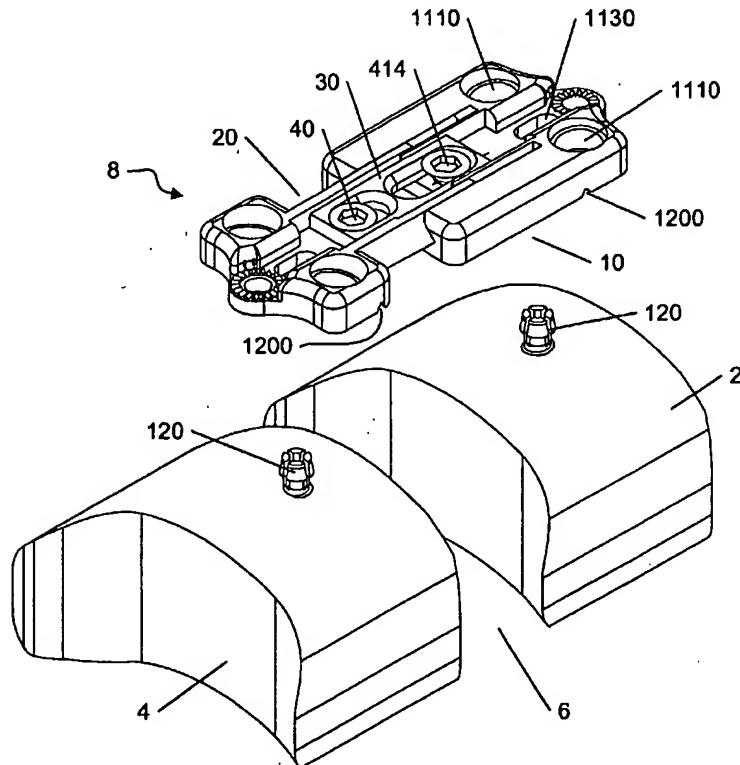
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(57)

#### ABSTRACT

A bone plating system is provided that permits maintenance of a compression force while also accommodating bony subsidence, among other features. Methods of implantation are also provided that improve alignment and placement during implantation and avoid maneuvers that weaken the vertebral bodies. A modular distraction screw is placed during the initial stages of surgery when all relevant landmarks are still intact. After completion of the surgical bone work, a proximal end of the distraction screw is detached, leaving a protruding distal segment implanted in the centerline of the vertebral bodies above and below the newly fused disc space. A bone plate is guided into proper position relative to the upper and lower vertebra by attaching the bone plate to the protruding distal segments. The distal segments of the distraction screws are tightened onto the plate and the plate is held stationary while bone screws are placed. The bone plating system is also extendable, allowing additional bone plates to be placed and coupled with existing plate components to create a multi-level plating system. Additional bone plates may be placed contemporaneously or during a subsequent surgical procedure.



distal segment 120 of the modular distraction screw and an end-coupler. These features have been described above and will not be illustrated further.

[0092] The plating system of the present invention can be applied, by way of a multilevel plating configuration to fixate three or more bones after the removal of two or more discs. As in the embodiments previously illustrated for single level plate, "multilevel" plates may be curved in either the vertical or horizontal plane, may contain one or more horizontal indentations in order to permit the placement of additional curvature in the vertical plane, and may be made of any biologically adaptable or compatible materials. Each of the upper and lower ends of the plates will contain two boreholes to accommodate bone fasteners, a central slot to anchor the distal segment 120 of the modular distraction screw and an end-coupler to accommodate possible modular extension of the fusion at a later date.

[0093] FIG. 17 shows an exemplary embodiment of the multi-level plates, where one of the number of sliding mechanisms can be used at each level such that the total number of sliding mechanisms is equal to the number of discs removed and fused. Longer plates can be made by the sequential addition of other levels. While the illustrated plate present only one exemplary embodiment of the sliding mechanism and coupler means, it is understood that any of the previously discussed embodiments may be used in any combination to produce these plates. Further, different sliding mechanism designs can be used at different levels, if desired.

[0094] With the exception of the two ends, a segment 300 with two full thickness bore holes is placed between each of the sliding portions. These boreholes may be oriented in the true vertical plane or form an angle with the vertical. The boreholes will be angled towards each other in the plate's short axis (horizontal plane) and form a right angle with the body of the plate in the long axis (vertical plane). The top opening of the boreholes may be flush with the plate surface or may be recessed. The distance between the boreholes may also vary depending on the requirement of plate application and design.

[0095] Removal of two or more discs is accomplished by the step-wise removal of individual discs until all pathological levels have been addressed. Modular distraction screws may be used at each vertebral level if desired, but their use is required only at the upper and lower-most vertebrae while conventional distraction screws can be used at all intervening levels. After completion of the bone work, the proximal segments of the distraction screws are removed leaving the distal segments attached to the upper and lower-most vertebral bodies. At other disc levels, the distraction screw can be completely removed after the completion of the bone work.

[0096] The plate is guided to proper position along the upper-most and lower-most vertebra by the attached distal segments—as described above for single level procedures. The distal segments of the distraction screws are tightened onto the plate after selection of optimal bone screw position. In this way, the plate is held stationary while the bone screws are placed into the upper and lower-most vertebrae and the plate is fixed at each end. Depending on surgeon preference, fixation of the intervening vertebral levels may be started from either end of the plate. For illustration, fixation will be

started inferiorly. The plate segment intended to fixate the vertebra immediately superior to the lower-most vertebra is moved into a desired position. The sliding mechanism between this segment and the plate segment attached to the lower-most vertebra is then locked. Once these segments are immobilized, bone screws are placed into the vertebra immediately superior to the lower-most vertebra. The process is repeated at each of the remaining vertebra. If compression is desired across the construct, it's applied across the upper and lower-most vertebrae prior to placement of the bone screws into any of the intervening vertebra. Compression is maintained until all the vertebrae have been fixed to the plate. Once all sliding mechanisms have been locked, the compression device may be released and the force will be maintained by the plate.

[0097] Alternatively, one or more sliding mechanisms can be used to accommodate boney subsidence at two or more fused levels. This is accomplished by using a slotted bore-hole between levels. FIG. 17A illustrates this design feature in a two level plate in which only one sliding mechanism is employed. Again, the plate is placed after completion of the bone work and plate placement is started by fixation of the plate at each end using the distal segments of the distraction screws. The plate is set to the desired length and the sliding mechanism is locked. If desired, compression may be applied prior to closure of the mechanism. The bone screw is placed at the end of the slotted borehole immediately adjacent to the sliding mechanism and the subsidence screw is opened. In this way, the plate's adjustable length and subsidence can be accomplished using a single sliding mechanism. While the second embodiment of the sliding mechanism as well as the alternative embodiments of the end-coupler and central channel are illustrated, it is understood that any of the previously discussed embodiments may be used in any workable combination to produce these plates.

[0098] FIG. 17B demonstrates the other potential designs that can be used for a three level plate. Other possible variations that can be used in creating a other multi-level plating system. Longer plates can be made by the sequential addition of other levels.

[0099] While the particular systems and methods herein shown and described in detail are fully capable of attaining the above described objects of this invention, it is to be understood that the description and drawings presented herein represent a presently preferred embodiment of the invention and are therefore representative of the subject matter which is broadly contemplated by the present invention. It is further understood that the scope of the present invention fully encompasses other embodiments that may become obvious to those skilled in the art and that the scope of the present invention is accordingly limited by nothing other than the appended claims.

#### What is claimed is:

1. A plating system for bone fixation for mammalian bone structures, comprising:
  - (a) a first plate segment and a second plate segment, each of the segments adapted to be affixed onto a bone structure with another bone structure in an aligned spatial relationship;

(b) a coupler means (coupling segment) being securable to the first plate segment and the second plate segment, the coupler means being selectively adjustable to define the movement (compression and subsidence) of the bone structures in the aligned spatial relationship.

2. The plating system of claim 1 wherein the coupler means is selectively adjustable to enable compression and subsidence of the bone structures in the aligned spatial relationship.

3. The plating system of claim 1 wherein the plates are slidably engaged substantially in the aligned spatial relationship.

4. The plating system of claim 1 wherein each of the plates has a projection portion and a receiving channel for complementary placement of the projection portion of one plate segment into the receiving channel of another plate segment.

5. The plating system of claim 1 wherein the first plate segment has at least one projection portion and the second plate segment has at least one receiving channel to receive the projection portion of first plate segment.

6. The plating system of claim 5 wherein the projection portion has a generally elongated body with cross-section shape selected from the shapes of a triangle, truncated triangle, rectangle, modified rectangle, and a trapezoid.

7. The plating system of claim 1 wherein the coupler means is selectively engaged with first plate segment and the second plate segment to secure one or both the plate segments to define the movement of the bone structures in the aligned spatial relationship.

8. The plating system of claim 1 wherein the coupler means comprises an elongated element and a plurality of fasteners for selectively engaging the plating segments.

9. The plating system of claim 8 wherein the coupler means has an opening to receive at least one fastener passing therethrough to engage one or both of the plate segments.

10. The plating system of claim 1 wherein the coupler means comprises stepped channel openings formed on the first plate segment and the second plate segment and arranged in a substantially overlapping relationship and defining an internal travel pathway between the first and the second plate segments; a bolt element having a threaded shank portion passing through the stepped channel openings with locking mechanisms at the ends of the shank to secure the plate segments;

and a frictional element fitted in the internal travel pathway and engageable by the threaded shank portion to couple the bolt element to either the first plate segment or the second plate segment.

11. The plating system of claim 10 wherein the frictional element has threads cooperating with and carried by the threaded shank portion of the bolt element to effect the selective engagement of the first plate segment or the second plate segment.

12. The plating system of claim 10 wherein the bolt element and the of the openings of the stepped channels are of substantially similar width.

13. The plating system of claim 10 wherein at least a portion of the frictional element and the internal travel pathway are of substantially similar width.

14. The plating system of claim 10 wherein the channel of the first plate segment has an enlarged opening defining a keyhole shape adapted to accept the locking mechanism including of the bolt element passing therethrough between

a first position outside the channel opening of the first plate segment to affix the spatial relationship of the plate segments in compression and a second position of the retainer within the internal travel pathway and enabling the relative movement of the first plate segment and the second plate segment for bone subsidence.

15. The plating system of claim 1 wherein the plate segments each has at least one opening to accommodate a bone screw for securing the plate segments onto the bone structures.

16. The plating system of claim 1 wherein the plate segments each has at least one opening to receive a portion of a distraction screw implanted at a predetermined landmark of the bone structure.

17. The plating system of claim 1 wherein the mammalian bone structure is a cancellous bone or cortical bone.

18. The plating system of claim 1, wherein at least a portion of the plating segments is constructed of a biologically adaptable or biologically compatible material.

19. The plating system of claim 18 wherein the biologically adaptable or biologically compatible material is selected from the group of materials consisting of stainless steel, titanium, combination metallic alloys, plastics, ceramics, osteo-conductive materials, and bio-active materials.

20. The plating system of claim 19 wherein the osteo-conductive material is a demineralized bone matrix, a hydroxyapatite, a transforming growth factor, platelet-derived growth factor or a bone-morphogenic protein.

21. The plating system of claim 1, wherein each of the plate segments has curved surfaces to conform to the surface contours of the bone structures.

22. The plating system of claim 1 wherein each of the plate further comprises an end coupler adaptable to be engaged by a distraction screw.

23. The plating system of claim 22 wherein the end coupler includes means for engagement with the distraction screw comprising interfitting threads or complementary spines.

24. A modular plating system for bone fixation for mammalian bone structures comprising:

(a) a plurality of plate segments, each of the segments adapted to be affixed onto a bone structure with another bone structure in an aligned spatial relationship; and

(b) a coupler means (coupling segment) being securable to at least two of the plate segments and selectively adjustable to define the movement (compression and subsidence) of the bone structures in the aligned spatial relationship.

25. A method for fixating mammalian bone structures comprising the steps of:

(a) implanting a first prosthetic device and a second prosthetic device at predefined locations along the anatomically desired plane of the bone structures;

(b) securing a first plate segment and a second plate segment onto the first and the second prosthetic devices, respectively; and

(c) attaching a coupler to the first plate segment and the second plate segment, wherein the coupler is selectively adjustable to define movement of the bone structures in the aligned spatial relationship.

26. The method of claim 25, further comprising securing the first plate segment and the second plate segment to the bone structures.

27. The method of claim 25 wherein each prosthetic device includes a portion of a distraction screw.

28. The method of claim 25 wherein the anatomically desired plane of the bone structures comprises the centerline of the bone structures.

29. The method of claim 25 wherein the securing step further comprises:

compressing a portion of the prosthetic device;

placing a portion of each plate segment between the bone structure and the compressed portion of the prosthetic device; and

decompressing the portion of the prosthetic device to secure the plate segment between the bone structure and the prosthetic device.

30. The method of claim 25 wherein the coupler is adjustable to maintain compression of the bone structures.

31. The method of claim 25 wherein the coupler is adjustable to allow subsidence of the bone structures.

32. A method for fixating mammalian bone structures comprising the steps of:

(a) on at least two mammalian bone structures respectively position a first distraction screw and a second distraction screw, each of the distraction screws com-

prises a proximal segment having an elongated body with an internal bore extending through the length of the elongated body; an deployable member disposed within the internal bore of the elongated body and adapted to be retractably deployed outside the internal bore and a prosthetic device including a head portion and a threaded shank portion and being detachably coupled to the elongated body;

(b) rotatably manipulating the distraction screws to effect the threading and affixation of the shank portions of the prosthetic devices onto the mammalian bone structures;

(c) detaching the elongated member segments from the prosthetic devices on the respective mammalian bone structures; and

(d) securing onto the first prosthetic device and the second prosthetic device respectively a first plate segment and a second plate segment, each of the segments being aligned in a spatial relationship and securing a coupler means. (coupling segment) to the first plate segment and the second plate segment, the coupler means being selectively adjustable to define the movement (compression and subsidence) of the bone structures in the aligned spatial relationship.

\* \* \* \* \*

43/7/112 (Item 112 from file: 350) [Links](#)

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0002220914

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**Osteosynthesis appts. for oblique and longitudinal fractures - has metal pins on ends of brackets which are connected by sliding sleeve and headed bar joint**

Patent Assignee: KAZAN TRAUMAT ORTHO (KZTR-R)

Inventor: KOBZEN E V

Patent Family ( 1 patents, 1 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
SU 751397	B	19800907	SU 2641316	A	19780615	198114	B

#### Alerting Abstract SU B

The equipment is in the form of two brackets (1,2) bearing rod (3) with dynamometric spring (4) and threaded pin (5) with gauge (6) and nut (7). The working ends of brackets (1,2) have heads (8,9) in whose apertures are fixed tubular guide reposition devices (10,11) with channels for pins (12,13). Device (11) has an additional aperture (4) for fitting the fastener (15) on the bone fragments (16).

Metal pins (12,13) are introduced through the tubular guides penetrating to a depth of 3-5 mm into the bone fragments which are realigned by rotating brackets (1,2), compressed by moving rod (3) then drilled through additional aperture (14) to the depth indicated by gauge (6). Fasteners (15) are fitted at an angle to each other, one perpendicular to the line of fracture, the other perpendicular to the bone axis. Bul.28/30.7.80.

**Title Terms /Index Terms/Additional Words: OSTEOSYNTHESIS; APPARATUS; OBLIQUE; LONGITUDE; FRACTURE; METAL; PIN; END; BRACKET; CONNECT; SLIDE; SLEEVE; HEAD; BAR; JOINT**

#### Class Codes

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Государственный комитет  
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# О П И С А Н И Е ИЗОБРЕТЕНИЯ

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### (54) СПОСОБ ОСТЕОСИНТЕЗА КОСЫХ И ПРОДОЛЬНЫХ ПЕРЕЛОМОВ И УСТРОЙСТВО ДЛЯ ЕГО ОСУЩЕСТВЛЕНИЯ

1

2

Изобретение относится к медицине, а именно к способам лечения переломов костей и устройствам для их осуществления.

Известен способ остеосинтеза косых и продольных переломов путем предварительной репозиции с последующим проведением трансфиксаторов через оба кортикальных слоя костных фрагментов [1].

Известный способ осуществляется с помощью устройства, которое содержит два кронштейна, связанных между собой с помощью стержня и резьбового пальца с гайкой [1].

Однако этот способ не позволяет выполнить закрытый остеосинтез и не обеспечивает высокой прочности соединенных костей.

Целью изобретения является выполнение закрытого остеосинтеза и увеличение прочности соединения костей.

Поставленная цель достигается тем, что при осуществлении способа остеосинтеза косых и продольных переломов в костные фрагменты в направлении совмещенных точек вводят через трубчатые кондукторы-репонаторы на глубину 3—5 мм металлические спицы, осуществляют репозицию и дозированную компрессию отломков, проводят спицы, засверливают костные фрагменты по каналу дополнительного трубча-

того кондуктора-репонатора, устанавливают фиксаторы под углом друг к другу, при этом один — перпендикулярно к линии излома, а второй — перпендикулярно к оси кости.

Кроме того, в устройство для осуществления предлагаемого способа остеосинтеза косых и продольных переломов рабочие концы кронштейнов имеют головки с пазом и отверстиями, в которых установлены трубчатые кондукторы-репонаторы, при этом одна из головок снабжена дополнительным отверстием, а на резьбовом стержне установлена пружина.

На чертеже изображено устройство для осуществления способа остеосинтеза косых и продольных переломов, общий вид в разрезе.

Устройство выполнено в виде двух кронштейнов 1 и 2, несущих на себе сопряженные стержни 3 с динамометрической пружиной 4 и резьбовой палец 5 с линейной шкалой 6 и гайкой 7 в виде барашка. На рабочих концах кронштейны 1 и 2 несут головки 8 и 9, в отверстиях которых закреплены трубчатые кондукторы-репонаторы 10 и 11, имеющие каналы под спицы 12 и 13. В кондукторе-репонаторе 11 выполнено дополнительное отверстие 14 для установки фиксатора 15 на костные фрагменты 16.

Способ осуществляется следующим образом.

После анестезии зоны перелома и предварительной репозиции под рентгеновским контролем через пункционные отверстия в мягкие ткани вводят трубчатые кондукторы-репонаторы 10 и 11 в направлении, соответствующем совмещаемым точкам поверхности излома. Через каналы кондукторов-репонаторов 10 и 11 на глубину 3—5 мм в костные фрагменты вводят спицы 12 и 13. За счет образованного упора репонаторов и спиц производят окончательную репозицию поворотом кронштейнов 1 и 2 и межфрагментарную компрессию путем перемещения стержня 3 на резьбовом пальце 5 гайкой 7. Дозирование воздействия на костные фрагменты осуществляют при помощи динамометрической пружины 4.

После получения полной адаптации и межфрагментной компрессии спицы 12 и 13 проводят через оба кортикальных слоя костных фрагментов, осуществляя временную трансфиксацию. Через свободное отверстие 14 двухканального кондуктора-репонатора 11 производят засверловку костного фрагмента на глубину, соответствующую линейной шкале 6, которая показывает расстояние между концами кондукторов-репонаторов 10 и 11 и соответствует необходимой длине фиксатора. После засверловки костных фрагментов в этом канале через кондуктор-репонатор 11 производят нарезку резьбы и устанавливают путем закручивания шурупа или вбивания штифта, который прочно скрепляют костные фрагменты. Спицы 12 и 13 удаляют, из тканей извлекают трубчатые кондукторы-репонаторы 10 и 11 путем откручивания гайки 7.

Для увеличения запаса прочности остеосинтеза по вышеописанному способу устанавливают второй фиксатор под углом к первому (т. е. V-образно). Манипуляции заканчиваются наложением гипсовой лонгеты для обеспечения покоя мягким тканям и уменьшения вредных нагрузок в зоне перелома.

Способ и устройство для его осуществления позволяют произвести закрытую окончательную репозицию, межфрагментарную дозированную компрессию, строго направленную установку костного фиксатора и получить устойчивый, прочный остеосинтез. Все манипуляции осуществляются

через пункционный канал в мягких тканях, который значительно менее травматичен, чем открытый остеосинтез. V-образное проведение двух фиксаторов обеспечивает устойчивый остеосинтез и хорошие условия репараторного остеосинтеза.

Показаниями к применению настоящего закрытого остеосинтеза являются косые, спиральные и крупнооскользчатые переломы длинных трубчатых костей, имеющие длину линии излома не менее двух диаметров фрагмента. Противопоказанием являются нерепонируемые переломы и значительная межфрагментарная интерпозиция, где показаны способы открытого остеосинтеза.

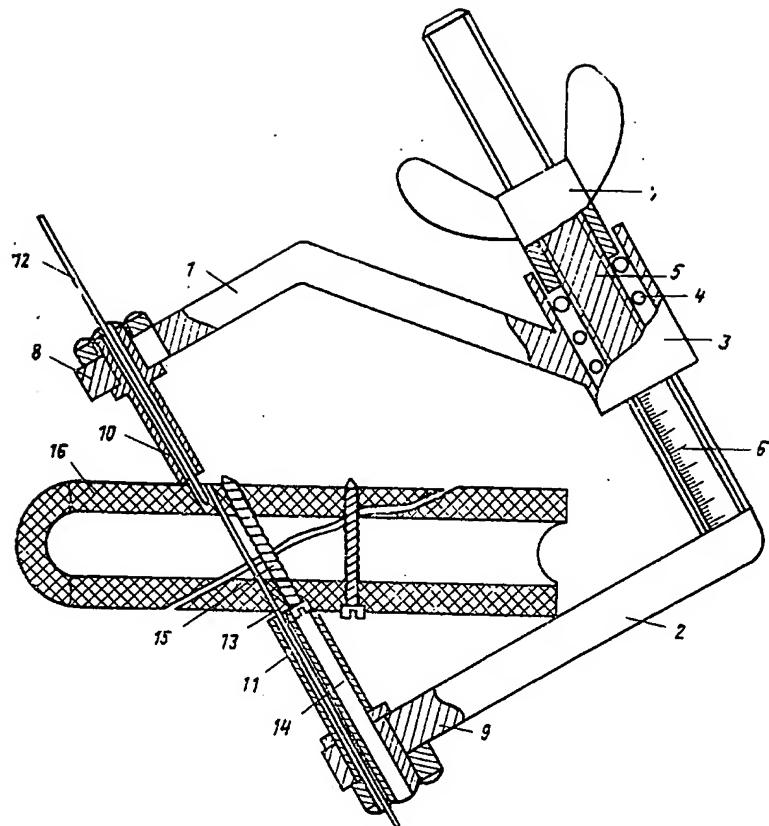
#### Формула изобретения

1. Способ остеосинтеза косых и продольных переломов путем предварительной репозиции с последующим проведением трансфиксаторов через оба кортикальных слоя костных фрагментов, отличающийся тем, что, с целью выполнения закрытого остеосинтеза и увеличения прочности соединения костей, в костные фрагменты в направлении совмещенных точек вводят через трубчатые кондукторы-репонаторы на глубину 3—5 мм металлические спицы, осуществляют репозицию и дозированную компрессию отломков, проводят спицы, засверливают костные фрагменты по каналу дополнительного трубчатого кондуктора-репонатора, устанавливают фиксаторы под углом друг к другу, причем один — перпендикулярно к линии излома, а второй — перпендикулярно к оси кости.

2. Устройство для осуществления способа по п. 1, содержащее два кронштейна, связанных между собой с помощью стержня и резьбового пальца с гайкой, отличающееся тем, что рабочие концы кронштейнов имеют головки с пазом и отверстиями, в которых установлены трубчатые кондукторы-репонаторы, при этом одна из головок снабжена дополнительным отверстием, а на резьбовом стержне установлена пружина.

Источник информации, принятый во внимание при экспертизе:

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0010768968 *Drawing available*

WPI Acc no: 2001-383315/200141

XRPX Acc No: N2001-281222

**Internal anterior transpedicular fixation system for treating vertebral burst fracture, has pair of support plates fixed to adjoining vertebra with fixation elements without relative movement**

Patent Assignee: UNIV HONG KONG (UYHK-N)

Inventor: LUD S; LU W; LUK D K

Patent Family (2 patents, 27 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
EP 1101448	A2	20010523	EP 2000403203	A	20001117	200141	B
US 6613051	B1	20030902	US 1999165971	P	19991117	200359	E
			US 2000714927	A	20001117		

Priority Applications (no., kind, date): US 2000714927 A 20001117; US 1999165971 P 19991117

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
EP 1101448	A2	EN	12	9		
Regional Designated States,Original	AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR					
US 6613051	B1	EN			Related to Provisional	US 1999165971

#### Alerting Abstract EP A2

**NOVELTY** - Supporting plates (10) each spanning at least one vertebra (S2) and having engaging portions (20,30) spanned by bridge portion, are fixed to vertebra. Each engaging portion has a receiving portion which is mounted to adjoining vertebra (S1,S3) with fixation elements (24,34). A clamp connects the bridge portions of supporting plates, restraining their relative movement.

**DESCRIPTION** - The bridge portion has a width smaller than the width of two engaging portions. One of the receiving portion has a threaded opening. The fixation element has a transpedicular screw having bone screw thread and plate screw thread adapted to engage with the threaded opening of the receiving portion. A lock (38) such as lock nut, is provided at the other end to lock the screw by engaging with the posterior surface of vertebra column. An INDEPENDENT CLAIM is also included for the method of supporting vertebra.

**USE** - For correcting spinal deformities anteriorly in treatment of vertebral burst fractures or tumors.

**ADVANTAGE** - The fixation system is capable of efficient management of thoracolumbar burst fractures and tumors and enables easy implantation. Allows a surgeon for full access to the disk area. Distributes compressive loads to the supports and prevents displacement of graft materials.

**DESCRIPTION OF DRAWINGS** - The figure shows the lateral **diagrammatic** view of the spinal anterior fixation system mounted on the portion of spinal column.

10 Supporting plates

20,30 Engaging portions

24,34 Fixation elements

38 Lock

S1-S3 Vertebra

**Title Terms /Index Terms/Additional Words:** INTERNAL; ANTERIOR; FIX; SYSTEM; TREAT; VERTEBRA; BURST; FRACTURE; PAIR; SUPPORT; PLATE; ADJOIN; ELEMENT; RELATIVE; MOVEMENT

### Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
A61B-017/56; A61B-017/70			Main		"Version 7"

US Classification, Issued: 606061000, 606073000, 623017110

File Segment: EngPI; ;

DWPI Class: P31

### Original Publication Data by Authority

### EPO

**Publication No.** EP 1101448 A2 (Update 200141 B)

Publication Date: 20010523

**Vorder- und transpediculares Fixiersystem und Verfahren zum Befestigen der Wirbelsaule**

**Anterior transpedicular fixation system and method for maintaining a vertebral column**

**Systeme de fixation transpediculaire anterieure et procede de maintien de la colonne vertebrale**

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Agent: Cabinet Hirsch, 34, Rue de Bassano, 75008 Paris, FR

Language: EN (12 pages, 9 drawings)

Application: EP 2000403203 A 20001117 (Local application)

Priority: US 1999165971 P 19991117

Designated States: (Regional Original) AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK

NL PT RO SE SI TR

Original IPC: A61B-17/70(A)

Current IPC: A61B-17/70(A)

Original Abstract: The present invention relates to an internal anterior transpedicular fixation system and a method for rigidly fixing the spine anteriorly at the level above and below a thoracolumbar burst fracture or tumor. The internal anterior transpedicular fixation system has a support member defining a plurality of engaging portions

thereon. At least two of the engaging portions are spaced longitudinally from each other and adapted to span at least one vertebra. At least two of the engaging portions are spaced laterally from each other and adapted to span a lateral distance of the vertebra. A plurality of fixation elements are provided to mount the engaging portions onto the vertebra. Thereby, the support member is restrained from rotational or translational movement relative to the vertebra.

Claim:

1. An internal anterior transpedicular fixation system for treating vertebral burst fractures or tumors which have been subjected to a vertebral body corpectomy, comprising:
  - a pair of supporting plates each spanning at least one vertebra and having a first engaging portion, a second engaging portion, and a bridge portion joining said first and second engaging portions, said first engaging portion defining a first receiving portion, said second engaging portion defining a second receiving portion;
  - a clamping member adapted to connect said bridge portions of said supporting plates; and
  - a plurality of fixation elements each adapted to mount one of said first and second receiving portions onto a vertebra;

whereby said supporting plates and the vertebra are restrained from relative rotational or translational movement.

## United States

Publication No. US 6613051 B1 (Update 200359 E)

Publication Date: 20030902

**Anterior transpedicular fixation system and method for maintaining a vertebral column**

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Language: EN

Application: US 1999165971 P 19991117 (Related to Provisional)

US 2000714927 A 20001117 (Local application)

Original IPC: A61B-17/56(A)

Current IPC: A61B-17/56(A)

Original US Class (main): 60661

Original US Class (secondary): 60673 62317.11

Original Abstract: The present invention relates to an internal anterior transpedicular fixation system and a method for rigidly fixing the spine anteriorly at the level above and below a thoracolumbar burst fracture or tumor. The internal anterior transpedicular fixation system has a support member defining a plurality of engaging portions thereon. At least two of the engaging portions are spaced longitudinally from each other and adapted to span at least one vertebra. At least two of the engaging portions are spaced laterally from each other and adapted to span a lateral distance of the vertebra. A plurality of fixation elements are provided to mount the engaging portions onto the vertebra. Thereby, the support member is restrained from rotational or translational movement relative to the vertebra.

Claim: We claim:

1. 1. An internal anterior transpedicular fixation system for treating spinal pathologies including vertebral burst fractures or tumors which have been subjected to a vertebral corpectomy, comprising:
  - a pair of supporting plates, each plate for spanning at least one vertebra and having a first engaging portion, a second engaging portion, and a bridge portion joining said first and second engaging portions, said first engaging portion defining a first receiving portion, said second engaging portion defining a second receiving portion;
  - a clamping member for connecting said bridge portions of said supporting plates; and
  - a plurality of fixation elements for mounting one of said first and second receiving portions onto a vertebra, wherein said fixation element is a transpedicular screw having a pointed tip, a bone screw thread portion in a middle portion of the screw and a plate screw thread portion adjacent to the pointed tip of the screw, said plate screw thread portion for engaging with said threaded opening in one of said first and second receiving portions;
  - whereby said supporting plates and the vertebra are restrained from relative rotational or translational movement.



US006613051B1

(12) **United States Patent**  
Luk et al.

(10) Patent No.: **US 6,613,051 B1**  
(45) Date of Patent: **Sep. 2, 2003**

(54) **ANTERIOR TRANSPEDICULAR FIXATION SYSTEM AND METHOD FOR MAINTAINING A VERTEBRAL COLUMN**

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(73) Assignee: The University of Hong Kong, Hong Kong (CN)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 50 days.

(21) Appl. No.: 09/714,927

(22) Filed: Nov. 17, 2000

**Related U.S. Application Data**

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(51) Int. Cl.<sup>7</sup> ..... A61B 17/56

(52) U.S. Cl. ..... 606/61; 606/73; 623/17.11

(58) Field of Search ..... 606/60, 61, 66, 606/69-73; 623/16.11, 17.11, 17.15, 17.16

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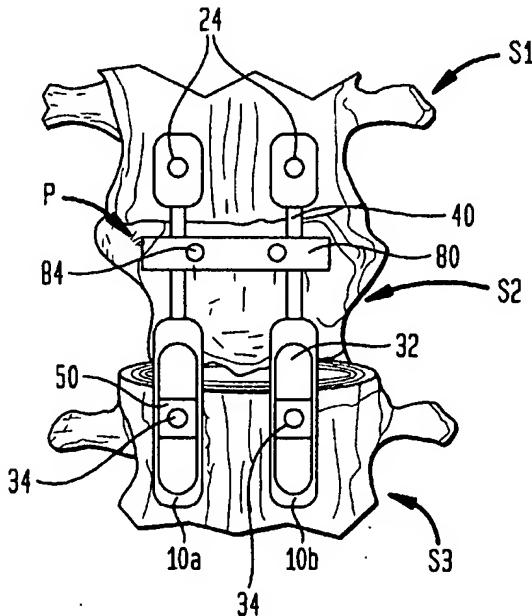
Primary Examiner—Michael Peffley

(74) Attorney, Agent, or Firm—Robert D. Katz; Cooper & Dunham LLP

(57) **ABSTRACT**

The present invention relates to an internal anterior transpedicular fixation system and a method for rigidly fixing the spine anteriorly at the level above and below a thoracolumbar burst fracture or tumor. The internal anterior transpedicular fixation system has a support member defining a plurality of engaging portions thereon. At least two of the engaging portions are spaced longitudinally from each other and adapted to span at least one vertebra. At least two of the engaging portions are spaced laterally from each other and adapted to span a lateral distance of the vertebra. A plurality of fixation elements are provided to mount the engaging portions onto the vertebra. Thereby, the support member is restrained from rotational or translational movement relative to the vertebra.

18 Claims, 5 Drawing Sheets



clamping member include two half members 82, as illustrated in FIGS. 3, 4, 8a, and 8b. The two-piece joining member 80 can be adapted to join each other by various conventional clamping mechanism, such as clamping screws 84.

As shown in FIG. 4, the two half members 82 are adapted to sandwich the bridge portions 40 of the supporting plates 10a and 10b. Each half member 82 can have at least one screw opening 86 thereon for receiving the clamping screws 84. By tightening the clamping screws 84, the supporting plates 10a and 10b can be clamped and fixed in relation to each other and thus restrained from rotational and translational movement. Accordingly, the joining member 80 can form a stable, firm, and symmetrical structure, which allows optimum anterior load distribution between the joined vertebrae and the supporting plates 10a and 10b. It will be appreciated that other embodiments of the joining member 80 are also within the scope of the present invention.

The anterior transpedicular system 1 of the present invention can be made of any suitable material. Preferably, the material forming the anterior transpedicular system 1 is a material that is bio-compatible. Additionally or alternatively, the material can have the required stiffness for anterior fixation of the spine. Exemplary materials can be FDA approved human implant metals (e.g., 316L stainless steel), titanium, and titanium alloy (e.g., titanium-vanadium-aluminum). It will be appreciated that other applicable materials are also within the scope of the present invention.

In a typical surgical procedure, the fixation elements 24 and 34 are inserted into and through a patient's vertebrae. Then the fixation elements 24 and 34 are made to extend through and partially engage with the receiving portions 22 and 32 of the supporting plates 10a and 10b. After applying compression and/or distraction to the supporting plates 10a and 10b, the fixation elements 24 and 34 can be completely joined with the receiving portions 22 and 32 to fix the supporting plates 10a and 10b to the patient's vertebrae, thereby forming a solid fixation. In the embodiment where transpedicular screws are used as the fixation elements 24 and 34, such transpedicular screws are inserted into a patient's vertebrae and the threaded holes 22 and 32 in the supporting plates 10a and 10b. Before the transpedicular screws 24 and 34 are to be firmly tightened, compression and/or distraction is applied to the supporting plates 10a and 10b.

FIG. 9 shows an alternative embodiment of the anterior transpedicular system of the present invention. In the following description, elements or components similar to those in the embodiment of FIGS. 1 to 8, are designated with the same reference numbers increased by 100 and redundant description is omitted.

According to the anterior transpedicular fixation system 101, the supporting plates 110a and 110b are integrated with the joining member 180 to form a unitary member. As a result, the anterior transpedicular fixation system 101 comprises longitudinal and transverse support members 110 and 180 that are integrally formed. The longitudinal support member 110 is adapted to span at least one vertebra. The transverse support member 180 is adapted to accommodate different width of the vertebrae of patients. The anterior transpedicular fixation system 101 also comprises a plurality of fixation elements 124 and 134 adapted to mount the anterior transpedicular fixation system 101 onto a patient's vertebrae. It is preferred that the various components of the anterior transpedicular fixation system 101 are made of rigid materials. Accordingly, the anterior transpedicular fixation

system 101 of the present invention is capable of supporting the spine and preventing vertebrae from rotational or translational movement.

It will be appreciated that the various features described herein can be used singly or in any combination thereof. Therefore, the present invention is not limited to only the embodiments specifically described herein. While the foregoing description and drawings represent a preferred embodiment of the present invention, it will be understood that various additions, modifications and substitutions can be made therein without departing from the spirit and scope of the present invention as defined in the accompanying claims. The presently disclosed embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and not limited to the foregoing description.

We claim:

1. An internal anterior transpedicular fixation system for treating spinal pathologies including vertebral burst fractures or tumors which have been subjected to a vertebral corpectomy, comprising:

a pair of supporting plates, each plate for spanning at least one vertebra and having a first engaging portion, a second engaging portion, and a bridge portion joining said first and second engaging portions, said first engaging portion defining a first receiving portion, said second engaging portion defining a second receiving portion;

a clamping member for connecting said bridge portions of said supporting plates; and

a plurality of fixation elements for mounting one of said first and second receiving portions onto a vertebra, wherein said fixation element is a transpedicular screw having a pointed tip, a bone screw thread portion in a middle portion of the screw and a plate screw thread portion adjacent to the pointed tip of the screw, said plate screw thread portion for engaging with said threaded opening in one of said first and second receiving portions;

whereby said supporting plates and the vertebra are restrained from relative rotational or translational movement.

2. The internal anterior fixation system of claim 1, wherein said first and second engaging portions each have a width, and said bridge portion has a width substantially less than the width of said first and second engaging portions.

3. The anterior fixation system of claim 1, wherein at least one of said first and second receiving portions is a threaded opening.

4. The anterior fixation system of claim 1, wherein said supporting plate includes a scalloped structure defined in at least one of said first and second receiving portions.

5. The anterior fixation system of claim 1, wherein said second receiving portions are elongated slots.

6. The anterior fixation system of claim 1, wherein said bone screw thread portion has a wider pitch and a deeper thread to purchase of bone.

7. The anterior fixation system of claim 1, wherein said transpedicular screw has a locking member provided at the opposite end of said plate screw thread portion for engaging said transpedicular screw onto the posterior surface of the vertebra.

8. The anterior fixation system of claim 1, wherein said fixation element further comprises a fastener member for engaging said plate screw thread portion on the transpedicular screw.

9. The anterior fixation system of claim 1, wherein said clamping member has an adjustable length.

10. An internal anterior transpedicular fixation system comprising:

a support member defining a plurality of engaging portions thereon, at least two of said engaging portions being spaced longitudinally from each other and for spanning at least one vertebra, at least two of said engaging portions being spaced laterally from each other and for spanning a lateral distance of said vertebra; and

a plurality of fixation elements for mounting said engaging portions onto said vertebra, wherein said fixation element is a transpedicular screw having a pointed tip, a bone screw thread portion in a middle portion of the screw and a plate screw thread portion adjacent to the pointed tip of the screw;

whereby said support members and said vertebra are restrained from relative rotational or translational movement.

11. The internal anterior fixation system of claim 10, wherein said support member comprises first and second engaging portions for spanning at least two vertebrae and third and fourth engaging portions laterally spaced from said first and second engaging portions, respectively.

12. The internal anterior fixation system of claim 10, wherein at least one of said engaging portions is a threaded opening for engaging with said plate screw portion on one of said fixation elements.

13. The internal anterior fixation system of claim 10, wherein at least one of said fixation members further comprises a fastener member adapted to join said fixation element with one of said engaging portions, and wherein said fastener member includes a threaded opening for engaging with said plate screw portion on said fixation element.

14. The internal anterior fixation system of claim 10, wherein each said fixation element has a locking member at the opposite end of said plate screw portion.

15. A method for supporting vertebrae, comprising: providing a fixation system comprising a support member and a plurality of fixation elements, said support member having first and second engaging portions for engaging with said fixation elements and for mounting onto at least one vertebra and said fixation element is a transpedicular screw having a pointed tip, a bone screw thread portion in a middle portion of the screw and a plate screw thread portion adjacent to the pointed tip of the screw;

forming a plurality of openings in the posterior surface bicortically of a displaced vertebra for receiving said fixation elements;

inserting said fixation elements from posterior vertebra bicortically into said openings respectively; and fixing said first and second engaging portions to their corresponding fixation elements to thereby support the vertebra.

16. The method of claim 15 further comprising: fixing one of said first and second engaging portions; and applying compression or distraction to the vertebra before fixing the other of said first and second engaging portions.

17. The method of claim 15, wherein said support member comprises a pair of supporting plates, each having a first engaging portion and second engaging portion, the method further comprising joining said supporting plates by a clamping member to thereby hold said supporting plates against axial and rotational movement.

18. The method of claim 17 further comprising: fixing one of said first and second engaging portions; applying compression or distraction to the vertebra before fixing the other of said first and second engaging portions; and joining said supporting plates by clamping member after applying compression or distraction to the vertebra.

\* \* \* \* \*

43/7/91 (Item 91 from file: 350) [Links](#)

Derwent WPIX

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0006315058 *Drawing available*

WPI Acc no: 1993-110241/199314

XRPX Acc No: N1993-083917

*Movements, BUT  
NO CIRCUITRY  
DESCRIBED  
REFERENCE MARKS*  
Bone regeneration plate with electronic sensors - uses microscopic movement to stimulate bone growth and thin film strain gauges to detect twisting or bending

Patent Assignee: CLASBRUMMEL B (CLAS-I)

Inventor: CLASBRUMMEL B

Patent Family ( 5 patents, 16 countries )

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
DE 4132021	A1	19930401	DE 4132021	A	19910926	199314	B
WO 1993006789	A2	19930415	WO 1992DE826	A	19920925	199316	E
EP 559870	A1	19930915	EP 1992920460	A	19920925	199337	E
			WO 1992DE826	A	19920925		
WO 1993006789	A3	19930708	WO 1992DE826	A	19920925	199513	E
EP 559870	B1	19960828	EP 1992920460	A	19920925	199639	E
			WO 1992DE826	A	19920925		

Priority Applications (no., kind, date): DE 4132021 A 19910926

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes			
DE 4132021	A1	DE	5	6				
WO 1993006789	A2	DE	19	6				
National Designated States,Original	JP US							
Regional Designated States,Original	AT BE CH DE DK ES FR GB GR IE IT LU MC NL SE							
EP 559870	A1	DE	19	6	PCT Application	WO 1992DE826		
					Based on OPI patent	WO 1993006789		
Regional Designated States,Original	AT CH FR GB IT LI SE							
WO 1993006789	A3	EN						
EP 559870	B1	DE	8	6	PCT Application	WO 1992DE826		
					Based on OPI patent	WO 1993006789		
Regional Designated States,Original	AT CH FR GB IT LI SE							

Alerting Abstract DE A1

The hollow **bone** regeneration plate consists of two overlapping titanium metal or alloy sections (4,6), joined by a telescopic mechanism (2) permitting stress inducing **movement**.

The telescopic mechanism has, e.g. a polygonal cross-section, limiting twisting between the two sections. The mechanism contains an elastic element (8), a pressure transducer (22), strain **gauge** (18) and thin film strain gauges to detect twisting or bending. These sensors are connected by a multiplexer to an active or passive transmitter (20). USE - In conjunction with control unit and stimulation device, microscopic **movements** in fracture area can be produced, accelerating **bone** regeneration process. Through internal measurements stimulus can be optimised.

**Title Terms /Index Terms/Additional Words:** **BONE; REGENERATE; PLATE; ELECTRONIC; SENSE; MICROSCOPIC; MOVEMENT; STIMULATING; GROWTH; THIN; FILM; STRAIN; GAUGE; DETECT; TWIST; BEND**

#### Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
A61B-017/00; A61B-017/58; A61B-017/68; A61F			Main		"Version 7"

File Segment: EngPI; EPI;

DWPI Class: S05; P31

Manual Codes (EPI/S-X): S05-A05; S05-D01C5

#### Original Publication Data by Authority

#### Germany

**Publication No.** DE 4132021 A1 (Update 199314 B)

**Publication Date:** 19930401

#### **Platte zur Osteosynthese**

Assignee: Clasbrummel, Bernhard, 4837 Verl, DE (CLAS-I)

Inventor: Clasbrummel, Bernhard, 4837 Verl, DE

Agent: Haft, U., Dipl.-Phys., 8000 Muenchen; Berngruber, O., Dipl.-Chem. Dr.rer.nat., 8232 Bayerisch Gmain; Czybulka, U., Dipl.-Phys., Pat.-Anwaelte, 8000 Muenchen

Language: DE (5 pages, 6 drawings)

Application: DE 4132021 A 19910926 (Local application)

Original IPC: A61B-17/58(A)

Current IPC: A61B-17/58(A)

Claim:

- 1. Platte zur Osteosynthese frakturierter Rohrenknochen, die mit einer Vielzahl von Schrauben versehen ist zur Verankerung in den miteinander zu verbindenden Fragmenten, **dadurch gekennzeichnet**, dass die Platte aus zwei in Langsrichtung hintereinander angeordneten Plattenteilen besteht, die über einen Teleskopmechanismus

miteinander verbunden sind, welcher axiale Relativbewegungen der beiden Plattenteile zueinander zur Einleitung kontrollierter Bewegungen in physiologischer Belastungsrichtung ermoglicht.

## **EPO**

**Publication No.** EP 559870 A1 (Update 199337 E)

**Publication Date:** 19930915

**PLATTE ZUR OSTEOSYNTHESSE**

**OSTEOSYNTHESIS PLATE**

**PLAQUE POUR L'OSTEOSYNTHESSE**

Assignee: Clasbrummel, Bernhard, Sender Str. 179, D-4837 Verl 1, DE (CLAS-I)

Inventor: Clasbrummel, Bernhard, Sender Str. 179, D-4837 Verl 1, DE

Agent: Haft, Berngruber, Czybulka, Postfach 14 02 46, D-80452 Muenchen, DE

Language: DE (19 pages, 6 drawings)

Application: EP 1992920460 A 19920925 (Local application)

WO 1992DE826 A 19920925 (PCT Application)

Priority: DE 4132021 A 19910926

Related Publication: WO 1993006789 A (Based on OPI patent )

Designated States: (Regional Original) AT CH FR GB IT LI SE

Original IPC: A61B-17/00(A)

Current IPC: A61B-17/00(A)

Original Abstract: The invention concerns a plate for use in the synthesis of fractured long bones, the plate having a multiplicity of bolts designed to anchor it in the fragments to be joined together. The plate is made up of two parts disposed next to each other in the longitudinal direction and connected to each other by a telescoping mechanism which permits longitudinal movement of the two plate parts relative to each other, thus enabling controlled micro-movements to be induced in the direction of physiological stress.

Claim: The hollow bone regeneration plate consists of two overlapping titanium metal or alloy sections (4,6), joined by a telescopic mechanism (2) permitting stress inducing movement.

The telescopic mechanism has, e.g. a polygonal cross-section, limiting twisting between the two sections. The mechanism contains an elastic element (8), a pressure transducer (22), strain gauge (18) and thin film strain gauges to detect twisting or bending. These sensors are connected by a multiplexer to an active or passive transmitter (20).

**Publication No.** EP 559870 B1 (Update 199639 E)

**Publication Date:** 19960828

**PLATTE ZUR OSTEOSYNTHESSE**

**OSTEOSYNTHESIS PLATE**

**PLAQUE POUR L'OSTEOSYNTHESSE**

Assignee: Clasbrummel, Bernhard, Sender Strasse 179, D-33415 Verl, DE (CLAS-I)

Inventor: Clasbrummel, Bernhard, Sender Strasse 179, D-33415 Verl, DE

Agent: Haft, von Puttkamer, Berngruber, Czybulka, Patentanwaelte Franziskanerstrasse 38, 81669 Muenchen, DE

Language: DE (8 pages, 6 drawings)

Application: EP 1992920460 A 19920925 (Local application)

WO 1992DE826 A 19920925 (PCT Application)

Priority: DE 4132021 A 19910926

Related Publication: WO 1993006789 A (Based on OPI patent )

Designated States: (Regional Original) AT CH FR GB IT LI SE

Original IPC: A61B-17/68(A)

Current IPC: A61B-17/68(A)

Claim:

- 1. Platte zur Osteosynthese frakturierter Roehrenknochen, die mit einer Vielzahl von Schrauben versehen ist zur Verankerung in den miteinander zu verbindenden Fragmenten, wobei die Platte aus zwei in Laengsrichtung hintereinander angeordneten Plattenteilen (4, 6) besteht, die ueber einen Teleskopmechanismus (2) miteinander verbunden sind, welcher axiale Relativbewegungen der beiden Platten zueinander ermoeglicht und zwischen den Plattenteilen (4, 6) ein elastisches Bauteil (8) aufweist, dadurch gekennzeichnet, dass zur Einleitung kontrollierter Bewegungen der beiden Plattenteile (4, 6) und damit der Knochenfragmente zueinander in physiologischer Belastungsrichtung das elastische Bauteil (8) so ausgebildet ist, dass es einer Annaeherung der beiden Plattenteile (4, 6) elastisch entgegenwirkt.
- 1. Plate for the osteosynthesis of fractured long bones, which is provided with a plurality of screws for anchoring in the fragments to be joined together, wherein the plate consists of two plate parts (4, 6) disposed one behind another in the longitudinal direction which are connected together by a telescope mechanism (2), which permits axial relative motions of the two plates and has between the plate parts (4, 6) a resilient component (8), characterised in that in order to produce controlled movements of the two plate parts (4, 6) and thereby of the bone fragments relative to one another in the physiological load direction the resilient component (8) is so formed that it resiliently counteracts an approach of the two plate parts (4, 6) relative to one another.

## WIPO

Publication No. WO 1993006789 A2 (Update 199316 E)

Publication Date: 19930415

### OSTEOSYNTHESIS PLATE

Assignee: CLASBRUMMEL, BERNHARD, DE (CLAS-I)

Inventor: CLASBRUMMEL, BERNHARD, DE

Language: DE (19 pages, 6 drawings)

Application: WO 1992DE826 A 19920925 (Local application)

Priority: DE 4132021 A 19910926

Designated States: (National Original) JP US

(Regional Original) AT BE CH DE DK ES FR GB GR IE IT LU MC NL SE

Original IPC: A61F-0/00(A)

Current IPC: A61F-0/00(A)

Original Abstract: Die Erfindung betrifft eine Platte zur Osteosynthese frakturierter Roehrenknochen, die mit einer Vielzahl von Schrauben versehen ist zur Verankerung in den miteinander zu verbindenden Fragmenten; die Platte besteht aus zwei in Laengsrichtung hintereinander angeordneten Plattenteilen, die ueber einen Teleskopmechanismus miteinander verbunden sind, welcher axiale Relativbewegungen der beiden Plattenteile zueinander zur Einleitung kontrollierter Mikrobewegungen in physiologischer Belastungsrichtung ermoeglicht.

The invention concerns a plate for use in the synthesis of fractured long bones, the plate having a multiplicity of bolts designed to anchor it in the fragments to be joined together. The plate is made up of two parts disposed next to

each other in the longitudinal direction and connected to each other by a telescoping mechanism which permits longitudinal movement of the two plate parts relative to each other, thus enabling controlled micro-movements to be induced in the direction of physiological stress.



⑯ BUNDESREPUBLIK  
DEUTSCHLAND



DEUTSCHES  
PATENTAMT

⑯ Offenlegungsschrift  
⑯ DE 41 32 021 A 1

⑯ Int. Cl. 5:  
A 61 B 17/58

DE 41 32 021 A 1

⑯ Aktenzeichen: P 41 32 021.2  
⑯ Anmeldetag: 26. 9. 91  
⑯ Offenlegungstag: 1. 4. 93

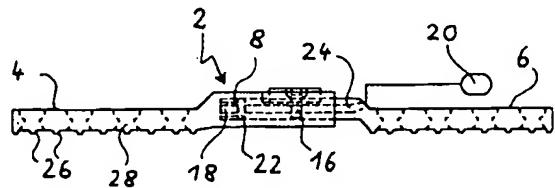
⑯ Anmelder:  
Clasbrummel, Bernhard, 4837 Verl, DE

⑯ Erfinder:  
gleich Anmelder

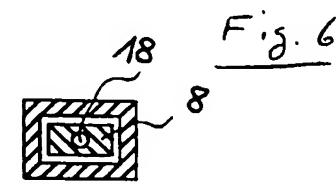
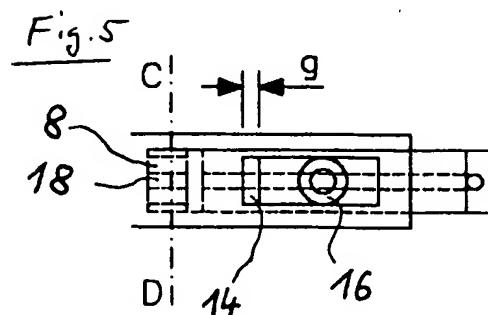
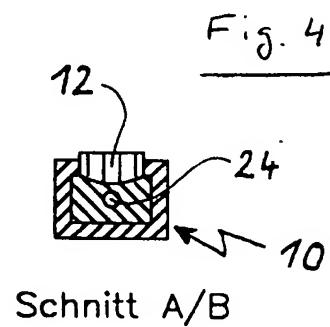
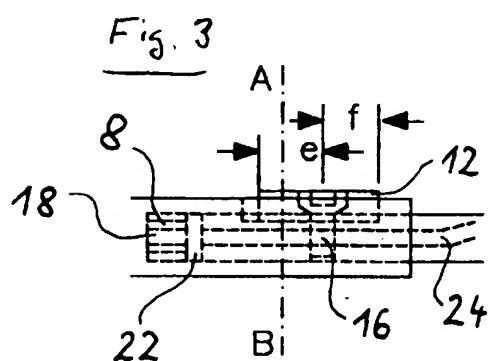
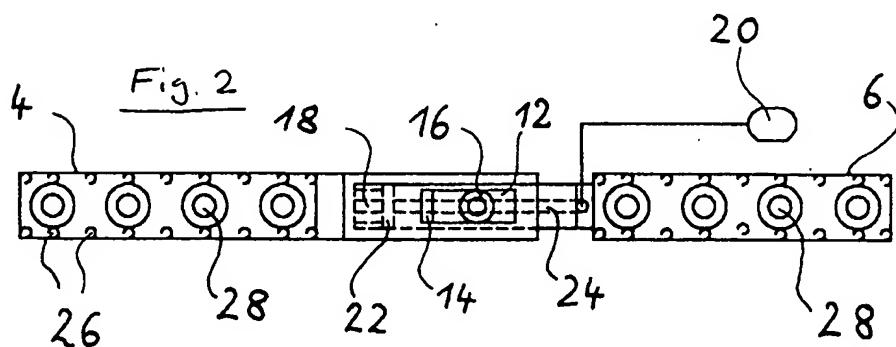
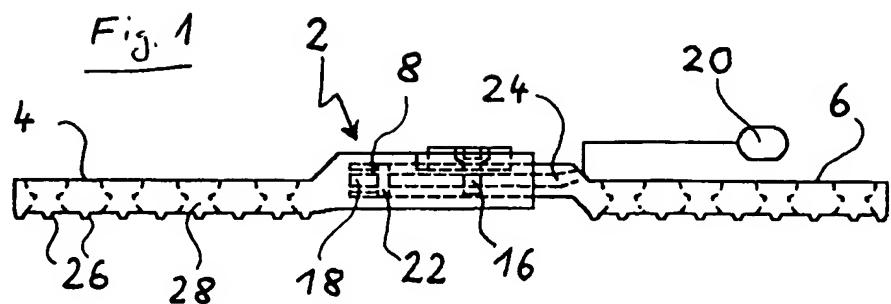
⑯ Vertreter:  
Haft, U., Dipl.-Phys., 8000 München; Berngruber, O.,  
Dipl.-Chem. Dr.rer.nat., 8232 Bayerisch Gmain;  
Czybulka, U., Dipl.-Phys., Pat.-Anwälte, 8000  
München

⑯ Platte zur Osteosynthese

⑯ Die Erfindung betrifft eine Platte zur Osteosynthese frakturierter Röhrenknochen, die mit einer Vielzahl von Schrauben versehen ist zur Verankerung in den miteinander zu verbindenden Fragmenten; die Platte besteht aus zwei in Längsrichtung hintereinander angeordneten Plattenteilen, die über einen Teleskopmechanismus miteinander verbunden sind, welcher axiale Relativbewegungen der beiden Plattenteile zueinander zur Einleitung kontrollierter Mikrobewegungen in physiologischer Belastungsrichtung ermöglicht.



DE 41 32 021 A 1



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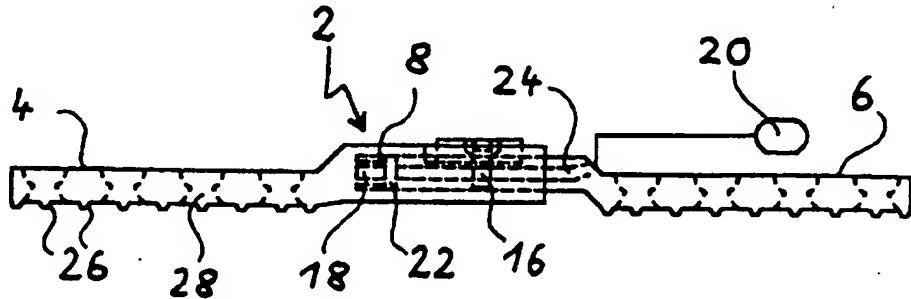
**PCT**

WELTOORGANISATION FÜR GEISTIGES EIGENTUM

Internationales Büro


**INTERNATIONALE ANMELDUNG VERÖFFENTLICH NACH DEM VERTRAG ÜBER DIE  
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)**

<b>(51) Internationale Patentklassifikation 5 :</b> A61B 17/58		<b>A3</b>	<b>(11) Internationale Veröffentlichungsnummer:</b> WO 93/06789 <b>(43) Internationales Veröffentlichungsdatum:</b> 15. April 1993 (15.04.93)
<b>(21) Internationales Aktenzeichen:</b> PCT/DE92/00826			<b>(81) Bestimmungsstaaten:</b> JP, US, europäisches Patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE).
<b>(22) Internationales Anmeldedatum:</b> 25. September 1992 (25.09.92)			
<b>(30) Prioritätsdaten:</b> P 41 32 021.2 26. September 1991 (26.09.91) DE			<b>Veröffentlicht</b> <i>Mit internationalem Recherchenbericht. Vor Ablauf der für Änderungen der Ansprüche zugelassenen Frist. Veröffentlichung wird wiederholt falls Änderungen eintreffen.</i>
<b>(71)(72) Anmelder und Erfinder:</b> CLASBRUMMEL, Bernhard [DE/DE]; Sender Str. 179, D-4837 Verl 1 (DE).			<b>(88) Veröffentlichungsdatum des Internationalen Recherchenberichts:</b> 8. Juli 1993 (08.07.93)
<b>(74) Anwalt:</b> HAFT, BERNGRUBER, CZYBULKA; Postfach 14 02 46, Hans-Sachs-Straße 5, D-8000 München 5 (DE).			

**(54) Titel:** OSTEOSYNTHESIS PLATE**(54) Bezeichnung:** PLATTE ZUR OSTEOSYNTHESE**(57) Abstract**

The invention concerns a plate for use in the synthesis of fractured long bones, the plate having a multiplicity of bolts designed to anchor it in the fragments to be joined together. The plate is made up of two parts disposed next to each other in the longitudinal direction and connected to each other by a telescoping mechanism which permits longitudinal movement of the two plate parts relative to each other, thus enabling controlled micro-movements to be induced in the direction of physiological stress.

**(57) Zusammenfassung**

Die Erfindung betrifft eine Platte zur Osteosynthese frakturierter Röhrenknochen, die mit einer Vielzahl von Schrauben versehen ist zur Verankerung in den miteinander zu verbindenden Fragmenten; die Platte besteht aus zwei in Längsrichtung hintereinander angeordneten Plattenteilen, die über einen Teleskopmechanismus miteinander verbunden sind, welcher axiale Relativbewegungen der beiden Plattenteile zueinander zur Einleitung kontrollierter Mikrobewegungen in physiologischer Belastungsrichtung ermöglicht.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/DE 92/00826

## A. CLASSIFICATION OF SUBJECT MATTER

IPC5

A61B 17/58

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5

A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,1 239 266 (H. G. VAN STEENBRUGGHE) 11 July 1960 see the whole document	1-11,15
X	CH,A,335 797 (ULRICH & CO.) 14 March 1959 see page 2, line 41 - line 64	---
A	WO,A,8 802 618 (ROYAL POSTGRADUATE MEDICAL SCHOOL) 21 April 1988 see page 9, line 1 - line 22 see page 12, line 2 - line 26	---
P,A	EP,A,0 450 423 (B. CLASBRUMMEL) 9 October 1991 cited in the application see figures 6,9	1,4,9,11

<input type="checkbox"/>	Further documents are listed in the continuation of Box C.	<input type="checkbox"/>	See patent family annex.
*	Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier document but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"A"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 27 May 1993 (27.05.93)	Date of mailing of the international search report 04 June 1993 (04.06.93)
Name and mailing address of the ISA/ EUROPEAN PATENT OFFICE Facsimile No.	Authorized officer Telephone No.